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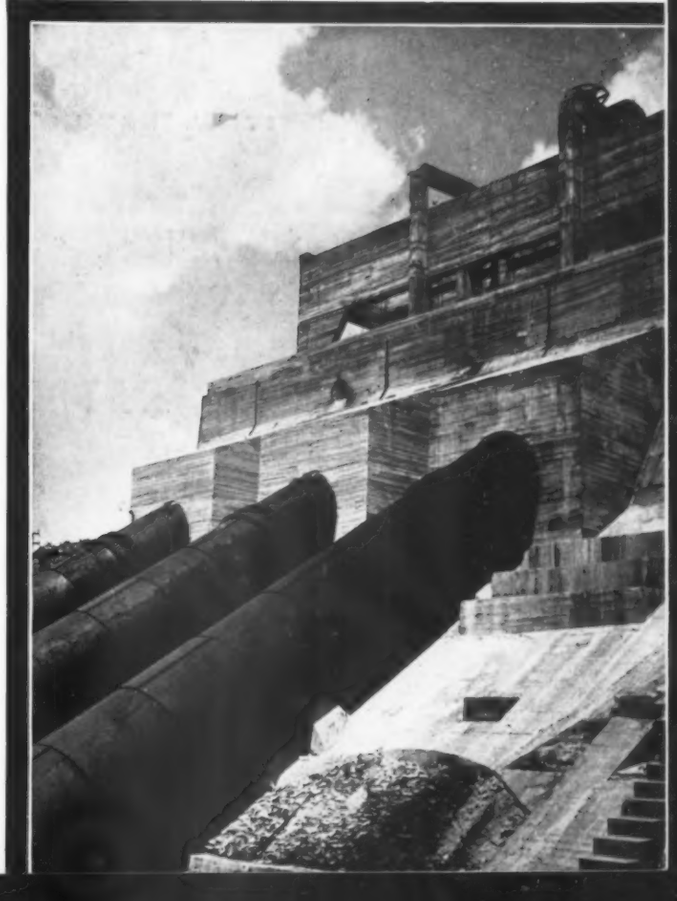
WORLD PETROLEUM

Formal Opening of Iraq Pipeline Marks Completion of Unique Construction Problem in Record Time • Confusion of Counsel Muddles Washington•Soviets Repel Price Cutting Accusation•Alcohol Situation Disturbs French Oil Trade



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WORLD PETROLEUM

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Haifa Harbor from Mount Carmel; one of the terminals of the great pipeline where Iraq oil reaches the Mediterranean.

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NEW YORK • # WORLD PETROLEUM • LONDON

Iraq's Place in the Sun

WHEN King Ghazi, on January 14, pulled the lever that started the engines turning in Station K-1 at Kirkuk he opened a new and significant chapter in the history of the world's oil development. Regarded merely as one of the outstanding feats of construction in the history of the petroleum industry the completion of the Iraq pipe line is an event of historic consequence. Of even more arresting significance is its economic effect in adding a new source of supply to the world's markets.

For these reasons it has seemed worth while to record somewhat fully the story of this great emprise and WORLD PETROLEUM is devoting a large part of the space in this issue to an account of this huge undertaking and to a description of noteworthy features of the line and its equipment. For their cooperation and assistance in enabling us to assemble this information we extend a grateful acknowledgment to the officials of the Iraq Petroleum Company and to the individuals whose joint efforts have made possible the construction of this great oil highway in record time, amid most difficult conditions. So many men participated in the work of development which has found its crowning achievement in the completion of the pipe line that it is impossible to apportion personal credit among them, but their names constitute a roll of honor for noteworthy industrial achievement.

While the 28,000,000 barrels of oil that Iraq will contribute to the world's supply is not a vast amount, scarcely more than ten day's output of the wells in the United States, its addition to other fields signalizes the steadily increasing extent to which oil is becoming an international commodity in point of production as well as in distribution. Time was, and not so long ago, when the world looked to the American Union to supply most of its requirements in the way of petroleum products. Today it is largely independent of the United States. Venezuela, Soviet Russia, Roumania, Persia and now Iraq are names that loom large in the current chronicles of the oil industry. These and other fields still awaiting development undoubtedly will supply in future an increasing proportion of the rapidly growing demand for oil and oil products throughout the Eastern Hemisphere.

Those who have given closest study to the subject agree that for the immediate future the Near East will be the theatre of most important events in the development of the petroleum industry. Where Persia and Iraq lead others are preparing to follow. The first great line of steel that has just been strung across the desert may be only the precursor of several others.

To the Kingdom of Iraq the tapping of her stores of liquid wealth should bring a new prosperity. To the men who organized and financed the enterprise its success conveys the consciousness of judgment vindicated. For those who participated in the work of construction there will remain the satisfaction of having played a part in a great undertaking and for many a year to come, in the building of other pipe lines in other waste places, tales will be spun of experiences in the lava country or in the treacherous reaches of the Wadi Tharthar. Iraq oil already has made important changes in the industrial map of western Europe where it has led to the building up of a great refining industry in France, with Italy about to follow. It may lead to many others before its story is completely told.

For the moment it is sufficient to acclaim the completion of a tremendous task, soundly planned, wisely directed and well executed. We welcome Iraq to the circle of great oil producing nations and we hail the men of high and low degree who have labored together to build the Iraq pipe line.

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Soviets' Problems

OF PERENNIAL interest to the international petroleum trade is the question of the position, policy and prospects of the oil industry in the Soviet Union. The rapid expansion of production and export under the first five year plan, the extension of sales organizations to important markets and the aggressive policy adopted in seeking export business led for a time to widespread apprehension of a possible flooding of international markets with Russian oil. Only thirty months ago the representatives of the leading international organizations, at a conference held in New York, offered the Russians a contract for their output, based on its being kept within certain limits, that would have been, as events have proved, tremendously costly to the buyers.

Since that time the picture has changed very greatly. While the former fear of disastrous results from Soviet competition still finds occasional expression those who have followed events closely consider that, for the immediate future at least, there is not the slightest danger of the world's markets being flooded by Russian oil. Representatives of the Soviet oil organization declare indeed that this danger never existed except in the imaginations of their competitors. In denial of the accusation of price cutting they adduce figures to show that their average

export prices have been above corresponding quotations at U. S. Gulf ports or at Constantza.

Aside from all questions of price, however, there is abundant evidence that the chief concern of the Soviet oil authorities for the present is to maintain the volume of export necessary to provide urgently needed credits and to fulfil existing contracts, without too greatly restricting supplies to their own industry.

During the past two years the Soviet output of tractors and motor cars has assumed important dimensions and the tempo of the movement toward industrialization has been greatly quickened. There has been a corresponding increase in the demand for gasoline, lubricating oil and fuel oil and the problem has arisen of satisfying internal needs without interfering with the established export movement. Comparison of official figures for ten months of 1934 with the corresponding period of 1933 shows a heavy decline in shipments to Germany. This perhaps explains the recently reported sale of DEROP, the Soviet marketing organization in Germany, to Benzolverband.

Shipments of motor spirit to Great Britain were off approximately 30 percent in 1934 as compared with 1933, according to the statistics available, and shipments of all products to France declined in about equal proportion. There have been reports of difficulties in meeting contract obligations with Petrofina in France though latest statements are that these have been adjusted.

Russia of course has no lack of crude resources. The difficulties experienced in maintaining the full volume of exports of products while at the same time satisfying rapidly expanding domestic needs are due to uneven production in important fields, to inadequate refining facilities, particularly a lack of cracking equipment, and to insufficient pipe line capacity. While the official program for oil industry development includes a large increase in refining and an approximate doubling of cracking capacity in the next two years Soviet manufacturing resources apparently are inadequate to sustain this program of expansion. If the most improved methods and equipment capable of insuring a larger recovery of gasoline from the crude are to be installed in time to keep up the desired balance between internal supply and export it probably will be necessary to import a considerable part of this equipment. The most likely source from which to obtain it is the United States. Although the negotiations as to claims and counter claims that have been carried on between the two governments during the past year, which were expected to clear the way for an increased trade, have been dropped, temporarily at least, it now appears probable that the question of credit can be dealt with through private agencies and that a large amount of American equipment of various kinds may be acquired by the Soviet Union during the next two or three years.

▼

Congress Rebuked

WHEN the Supreme Court of the United States, on January 7, pulled the prop from beneath Presidential control of oil production and transportation it carefully avoided passing on the power of the federal government to deal with this subject. Its finding was primarily a rebuke to Congress for attempting to abrogate its legislative function and to pass this over to the President. On this subject the Court's opinion was forthright and vigorous.

"Section 9 (c)," says the Court, "establishes no criterion to govern the President's course. It does not require any finding by the President as a condition of his action. The Congress . . . declares no policy . . . gives to the President an unlimited authority to determine the policy and to lay down the prohibition, or not to lay it down, as he may see fit. . . . If Section 9 (c) were held valid it would be idle to pretend that anything would be left of limitations upon the power of the Congress to delegate its law-making function . . . Instead of performing its law making function the Congress could at will and as to such subjects as it chooses transfer that function to the President or other officer, or to an administrative body. The question is not of the intrinsic importance of the particular statute before us, but of the constitutional processes of legislation which are an essential part of our system of government."

The judgment of the Court indicates with sufficient clarity the course which the federal legislature should follow if it desires to stop the movement of "hot" oil or to prevent the reckless waste of national resources. Its decision is not a blow to the effective regulation of oil production and transport except as it invalidates the means by which this was being attempted at the moment. It is a stern indictment of the Congress for its cowardice or slovenliness in attempting to avoid the duty placed on its members by the Constitution and in seeking to hand over its functions to the President.

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Texas Holds the Pass

THAT the expected debacle of crude prices did not follow immediately on the heels of the Supreme Court decision and the withdrawal of the federal tender board was due to the state authorities of Texas. Having received broader powers than it formerly possessed for controlling the movement of oil within the state and having its own tender system in operation the Texas Railroad Commission stepped into the breach left by the suspension of federal activity and has held it for the time being at least. The Commission insists that all shipments of oil, whether intrastate or interstate, must be documented with its approval and has had the support of the railroads in its position. According to reports from the locally informed in East Texas the quantity of hot oil moving out of the state has increased somewhat since the federal tender board suspended operations but has by no means approached the volume that was moving before the tender system was introduced. For the present the price structure has been maintained. How long the state authorities can hold the situation in hand remains to be seen.

As a matter of expediency, aside from any higher motive, the course adopted by the Texas commission is a wise one. Texas is opposed to federal control or regulation; the surest way to escape it is to demonstrate that the states, singly or collectively, can exercise effective control. Texas resents some of the opprobrious epithets applied to the state and its citizens by Secretary Ickes; the best answer is to show that Texas is opposed to "hot" oil and is capable of dealing with it. Whatever the animating purpose Texas has risen to the situation created by the Supreme Court decision and has handled it thus far with commendable vigor.

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Monopolistic Fallacy

FOREIGN MINISTER SLAVESCU of Roumania is the latest European statesman to discover the great virtue of a government oil monopoly which he now advocates. There is an old saying that politicians are the last to learn. It might be amended by the observation that some of them never learn. At the present time the Roumanian oil industry is staggering under a load of oppressive taxation and suffering from governmental interference that makes its operations unprofitable and seriously impairs its ability to hold its own in international competition. The only thing needed to reduce it to complete demoralization is the institution of a government monopoly. At the same time the institution of a monopoly almost certainly would be a losing move for the government. By no stroke of political management could it extract from the industry as much as it now receives in taxes and it would have to assume the losses now borne by company shareholders.

World Significance of Iraq Development

Stands as Example of International Cooperation Among Leading Interests. Rapid Completion of Pipe Line Construction Despite Difficulties Never Before Encountered Makes It Rank as Epic Task.

By Sir John Cadman
Chairman, Iraq Petroleum Company, Ltd.

THE entry of Iraq into the circle of the world's oil producing countries was signalized by the official ceremonies which took place early in the current year at Kirkuk, Tripoli and Haifa.

The idea of developing the oilfields of Iraq by joint international effort dates back to the pre-war period—the Turkish Petroleum Company having been formed in 1912—but it was not until 1928 that, with the admission of American interests, the enterprise assumed its present complexion as a consortium of American, British, Dutch and French oil interests.

The company (renamed the Iraq Petroleum Company) obtained its concession from the Iraq Government in March, 1925. By the autumn of 1928 eight drilling rigs were in operation, and phenomenally successful results had attended the sinking of the well known as Baba Gurgur No. 1. The main efforts of the company were thereupon directed towards consolidating its knowledge of the potentialities of the new field, and in negotiating a revised concession with the Government of Iraq whereby in 1931 the company undertook to construct a pipe line capable of conveying oil at the rate of 3,000,000 tons per year and to complete that construction by the end of December 1935. Under this new concession the exploitation of 30,000 square miles was entrusted to the company.

A start was made in the summer of 1932 with the line from Kirkuk to Haditha, whence two lines were designed to bifurcate to Tripoli and Haifa respectively. So rapidly and effectively did the work proceed that, by August 1934, the first tanker had loaded at Tripoli, followed, three months later, by the first tanker at Haifa. The Iraq Petroleum Company can, I think, view with no small measure of pride the accomplishment of this task in face of difficulties of a kind never before encountered even in America, the home of pipe line construction and, indeed, of the oil industry itself.

It may well be claimed that, in each department, the job is an epic of its kind. The coordination of labor, the purchase and mobilisation of material, the establishment of transport, water supplies, communications, medical, commissariat and housing facilities, taken in conjunction with the maintenance of amicable relations with the authorities of five nations and innumerable local personages, all demanded first-class organisation and individual ability of a high standard.

Completion of the actual construction work within two years, and eighteen months in advance of the date which the company had accepted as its obligation, is sufficient testimony to the efficiency with which all these tasks were tackled. A pipe line system 1,150 miles in length now spans the territory, for the most part a sterile and waterless desert, which centuries ago was traversed by the first trade routes and which might therefore be called the birthplace of international commerce.

To the oil industry at large it is, perhaps, a somewhat disturbing fact that Iraq oil becomes available for distribution at a time when there still exists a marked lack of equilibrium between supply and demand. The precise effect upon markets remains to be seen, but it is to be hoped and believed that the good sense displayed by the leading concerns in recent years, in the effort to achieve such an equilibrium, will continue to be evidenced in this new venture.

No matter, however, what commercial results may follow, I feel sure the engineering achievement alone which this pipe line represents, will stand for many years as a high tribute to the qualities of the men who brought it into being.

Sir John Cadman, C.G.M.G., D.Sc., Chairman of the Iraq Petroleum Company, Ltd.

Forty Centuries of Iraq Oil

Newest of World's Oil Fields Is Probably Also the Oldest in Which the Product Has Been Put to Human Use—Pipe Line Completion Its Crowning Development.

NEWEST and oldest of oil fields is Iraq. Perhaps the first steps toward refining were taken here. At any rate the archaeologists delving amid the ruined cities of the Mesopotamian plain have found that bitumen was used extensively in the construction of their buildings. Going still further back there is the Biblical statement that Noah in building the Ark gave it a coating of pitch without and within. Certainly there is abundant evidence that the existence of petroleum was known and that the knowledge was usefully applied centuries before the beginning of modern civilization in the West.

That the larger development of these rich resources should have waited until the present day has been due to the ruin spread over this whole region by centuries of warfare and raiding, leaving it far removed from the areas of industrial progress and of consequent demand for the treasure hidden beneath its barren wastes. As time went on and the essential value of petroleum and its products to the specialized activities of an industrialized world became more fully understood there were numerous aspirants for the task and the risk of finding Iraq oil and putting it to wider use than the waterproofing of Tigris river boats.

From 1900 on a succession of efforts were made by German, British, Dutch and American capitalists to obtain concessions for developing the oil resources of Mesopotamia. Dominion over the territory, nominally at least, rested with the Turkish government and political disturbances in Turkey delayed the progress of negotiations by the rival interests. Ultimately the Turkish Petroleum Company obtained in 1914 a concession which has since been recognized as valid. One of the men instrumental in obtaining this concession who is still an active factor in the Iraq Petroleum Company as the Turkish Petroleum Company has been rechristened is C. S. Gulbenkian, an Armenian who has become a well-known international financier.

It was the Great War that finally determined the future of Iraq oil. It impressed upon the nations as nothing before had done the dependence of military and particularly of naval operations upon liquid fuel. Existence of known petroleum deposits within its borders as delimited by the Treaty of Lausanne was a chief factor in causing the Kingdom of Iraq to be set up as a separate nation, temporarily under British mandate. Participation in the development of these deposits was made the subject of a special agreement between Great Britain and France which led after much diplomatic discussion to the later inclusion of American interests. Thus the Iraq Petroleum Company Ltd. as finally constituted be-

Nationality	Proportionate Share, Percent	Company or Group	Directors
British	23.75	Anglo-Persian group	William Fraser Sir John B. Lloyd
Dutch and British	23.75	Anglo Saxon Petroleum Co. Ltd. (Royal Dutch-Shell group)	Andrew Agnew J. B. Aug. Kessler
French	23.75	Cie. Francaise des Petroles (French Government and private companies)	Robert Cayrol Ernest Mercier
American	23.75	Near East Development Corporation Standard Oil Co. (New Jersey) and Socony-Vacuum	Montagu Piesse H. G. Seidel
Personal	5.	Participations and Investments Ltd. (Holding interest originally assigned to C. S. Gulbenkian)	N. S. Gulbenkian
Iraq	....	Government of Iraq	Ja'far Pasha El Askari

Blasting a trench across the desert to the sea for the Iraq pipeline

The Pioneer

A big six-wheeler hauling oil pipe on the Iraq fields. Reproduced from a drawing by courtesy of Scammell Lories, Ltd.

came a British company with headquarters in London and with Sir John Cadman, distinguished leader of the British petroleum industry as its chairman. The division of ownership and the directors who represent at present the various participating interests are shown in the accompanying table.

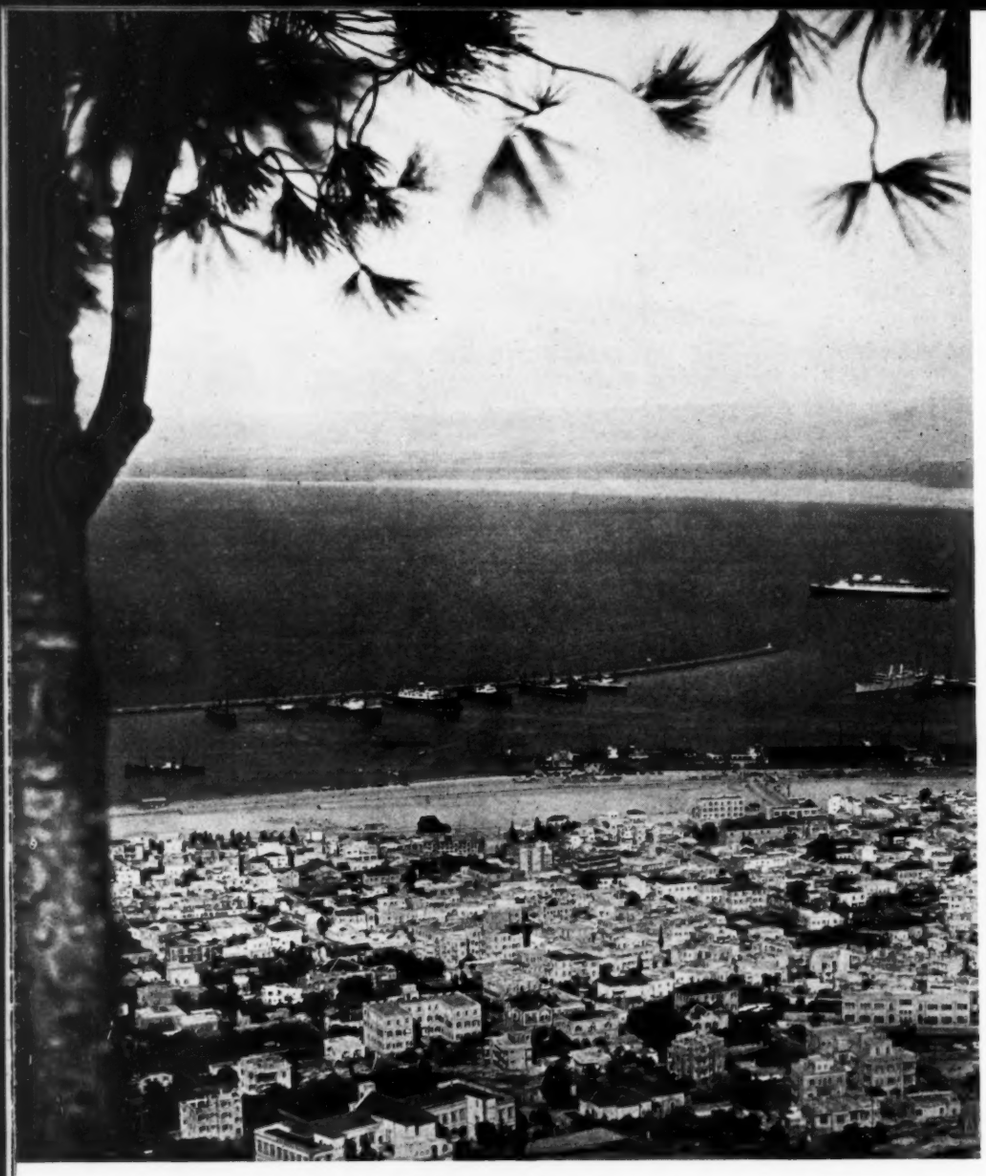
The managing director of the company is John Skliros who was instrumental in concluding the agreement with the Government of Iraq under which the company now operates.

It was in 1925 that the convention between the company and the Iraqui authorities was concluded. This agreement, as revised in 1931, provides that the company shall have for a period of 75 years the exclusive right to take, transport and sell petroleum products obtained from the territory included in the vilayets of Baghdad and Mosul, from the east bank of the Tigris to the Turkish and Persian borders, except for the area known as the Transferred Territories to which the Anglo-Persian Oil Company has a previous claim. It was stipulated in the agreement that the company should construct a pipe line of not less than 3,000,000 tons annual capacity by way of Rutbah to a terminal in the Bay of Acre (the present Haifa terminal) while at its option it might construct another line to any other Mediterranean port it might select. At least 50 percent of the capacity of the pipe line was to be on the specified route until it was capable of handling 4,000,000 tons annually. The pipe line was to be completed by December 1935. Actually it was finished more than a year earlier.

For the first 20 years of its operation the company was to pay to the government of Iraq a royalty of four shillings (gold) per ton, the total payment to average not less than £400,000 annually. After the expiration of this period the rate of payment was to vary according to the market price of oil and the profits of the company but in no case was to be less than two shillings or more than six shillings per ton.

The company was authorized to construct railways, telegraph and telephone lines, roads, bridges, buildings and reservoirs and other works necessary to its operations. At the end of 75 years all of its property and equipment is to revert to the government without charge.

Drilling began in April 1927 and on October 14 of that year proof of the existence of an important oil field at Kirkuk was obtained when the famous well, Baba



General view of Haifa harbor with the ss. Conte di Savoia lying just outside the breakwater.

Gurgar No. 1, was brought in, running wild for a number of days and sending a river of oil flowing down the near-by valley before it could be brought under control. Oil in abundance was there and oil of good quality testing about 36 deg. Baumé. While the exact volume of flow was not determined it was estimated that Baba Gurgar while it ran free was producing over 60,000 bbl. per day.

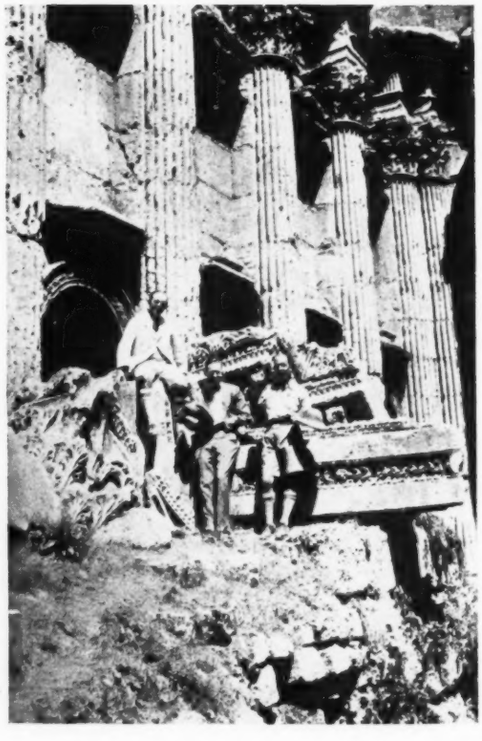
Following this initial success drilling was rapidly extended in the Kirkuk section and wells were sunk at other selected points in the territory covered by the concession. After the preliminary exploration had been carried to a point deemed satisfactory by the company the pace of new drilling was slackened but one rig has been kept steadily at work and 42 wells have now been completed. Subsequently, the company agreed to relinquish its claim to all territory west of the Tigris and its producing operations for the near future at least will be confined mainly to the Kirkuk field.

By the terms of the agreement reached in 1925 the company undertook to construct a pipe line but without specification as to its size or the route that it was to follow. Once the productive possibilities of the field were proved the construction of the line became the matter of next urgent importance. Discussion of the route to be followed developed a sharp divergence of opinion within the company itself and between the governments most directly concerned. The British favored a route passing through British mandated areas while the French preferred to have the terminus of the line in Syria where their influence was dominant. They claimed also that this route presented superior advantages in the shipment of oil to Western Europe. Ultimately a diplomatic solution was reached through a decision to construct two lines. According to this plan a double line was to be run from Kirkuk to Haditha on the Euphrates bifurcating there into two systems. One of these continued nearly due west through Syria to Homs and thence through Alaouite and Lebanon to Tripoli on the Mediterranean. The other line dipped southward from Haditha through southwestern Iraq, across Trans-Jordan and Palestine to a terminus on the Bay of Acre. Because its main course lies within French mandated territory the northern branch is often referred to as the French line while the other for a similar reason is described as the British line, but both of course are component parts of the Iraq Petroleum Company's transport system.

This decision as to routes was reached of course only after extensive surveys had been made. It was incorporated in the revised agreement concluded by the company with the Iraq government in 1931 which provided that the line with a minimum annual capacity of 3,000,000 tons should be completed by the end of 1935. As actually designed the line has a capacity of 4,000,000 tons.

Aside from the matter of route there were many other questions that called for tactful handling on the part of those directly in charge of the construction of the line. With four nations participating in its ownership it was necessary to consult the wishes of each group and to utilize so far as possible the engineering skill and

Members of the Iraq Petroleum Company at a desert ruin in Iraq.



experience of each country. This was done through the creation of advisory committees to deal with each branch of the work. It was natural too that each national group should wish the manufacturers of its own country to share in supplying the equipment to be used. To do this without disagreements and with due regard to the necessity of obtaining all supplies economically demanded the exercise of business skill and tact. That it was accomplished successfully is a tribute to the directors of the company's operations. As it stands the pipe line represents the joint contributions of leading engineering and manufacturing firms in the United Kingdom, France, the United States and Holland, together with smaller purchases from Germany and other countries.

Through the fact that several of the world's greatest oil companies were connected with the project the Iraq Petroleum Company has been in the fortunate position of being able to draw upon the experience and personnel of these companies and to have at its command probably the finest group of pipe line engineers and workers ever brought together on a single construction enterprise. Because of their greater experience in pipe line building actual direction of the construction was largely in the hands of Americans and Britons but the services of French and Dutch engineers also were availed of freely. The result may truly be termed a monument to international cooperation.

Fuel gatherers in the desert pause to inspect the new pipeline.

Remains of an earlier civilization that used Iraq oil for its temple fires.

Conventions with the countries besides Iraq through which the pipe lines were to pass—Palestine, Trans-Jordan, Syria and Lebanon—were concluded in 1931.

Surveys of alternative routes and study of the course finally selected to determine its engineering and transport requirements extended over the period from 1928 to 1931. Early in 1932 the assemblage of equipment and material began and in September the stringing of pipe was started from the three terminal points. On November 19, 1933, the final connection was made, establishing a through line from Kirkuk to the Mediterranean.

The first oil to be conveyed throughout the length of the pipe line reached Tripoli on July 14, 1934, and the first cargo of Iraq oil to leave the terminal arrived in late August at Havre, France, where its reception was celebrated with appropriate ceremonies. Regular shipments were made from that time on although many final details remained to be completed at stations and terminals. Formal opening of the line took place with special ceremonies at Kirkuk, Haifa and Tripoli, extending from January 15 to January 24, 1935.

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Front Cover

THE illustration on the cover of this issue of WORLD PETROLEUM shows a striking view of the River Jordan relief station on the Iraq pipe line where the huge Diesel pumps force Iraq oil over the last stages of its 600 mile journey to the sea. The photograph is reproduced by courtesy of the Orient Press Photo Co.

His Majesty King Ghazi of Iraq

Iraq Line Formally Opened by King Ghazi

FORMAL inauguration of the Iraq pipe line took place during the past month in a series of ceremonies which began at Kirkuk January 14, and which were attended by state functionaries, visiting delegates from other governments, distinguished guests and leading officials of various oil companies. The air liner Syrinx, seating 24 persons, was chartered by the Iraq Petroleum Company to bring prominent guests from England and France and to convey them over the route of the pipe line.

One of the impressive features of the Kirkuk celebration was the arrival by plane of King Ghazi of Iraq, who flew from Baghdad at the head of a division of army aircraft. He was welcomed by Sir John Cadman, chairman of the Iraq Petroleum Company, Sir Francis Humphreys, British Ambassador to Iraq, and a large group of Iraqi and visiting officials. After an inspection of headquarters buildings King Ghazi personally turned a handle which set in motion the huge engines and pumps at Station K-1, where the guests had assembled in the pump house, and started an endless flow of oil pulsating on its way to the Mediterranean and the markets of Europe.

At the luncheon which followed Sir John Cadman proposed the health of the King and said that his presence established a personal bond of sympathy between the government and the company. It exemplified the statesmanship and unsparing pains that had entered into the development of Iraq's industrial enterprise.

The building of the pipe line had required a large personnel and half a million tons of costly and diversified materials transported over great distances in a difficult terrain. All difficulties had been overcome and the line completed a year before the agreed date as the result of a sound original conception, efficient control and a careful selection of personnel, together with local cooperation and goodwill. He acknowledged the valuable assistance extended by the ministers and officials of Iraq and said that 98 percent of the workers engaged in the pipe line construction in Iraq had been natives of the country. In conclusion he extended sincere wishes for the health and prosperity of the King, the Government and the people.

In his reply King Ghazi expressed his appreciation of the sound technique and good administration that had marked the company's operations, emphasized the friendly cooperation that had prevailed and voiced his pleasure at the important part played in the work of construction by the Iraqi with profitable training for themselves. He hoped for further benefits to the country as the company's operations expanded.

A casket of gold and silver decorated with finely chiseled gold figures of Iraqi workmen, typifying their part in the construction of the pipe line, was presented to the King.

Following the inauguration of the pipe line at Kirkuk special ceremonies were held at Damascus, attended by the President of the Syrian Republic and other government officials. A casket ingeniously designed to represent a section of the pipe line was presented to the President as a souvenir of the occasion.

On January 19 the terminal at Tripoli was opened by Comte de Martel, French High Commissioner.

Formal inauguration of the Haifa terminal occurred on January 22. A beautiful Haifa rose bowl was presented to Sir Arthur Grenfell Waucope on this occasion. The final ceremony took place at Amman, Trans-Jordan, on January 24 with a luncheon attended by the Amir Abdullah, thus completing the round of entertainments which included a special ceremony in each of the countries through which the pipe line passes.

Tripoli: off the desert and into the sea runs the great pipe line at the western terminal.

Laying the pipe at the approach to a swamp.

Iraq Pipe Line Construction

Unusual Problems Presented by Character of Territory Traversed.

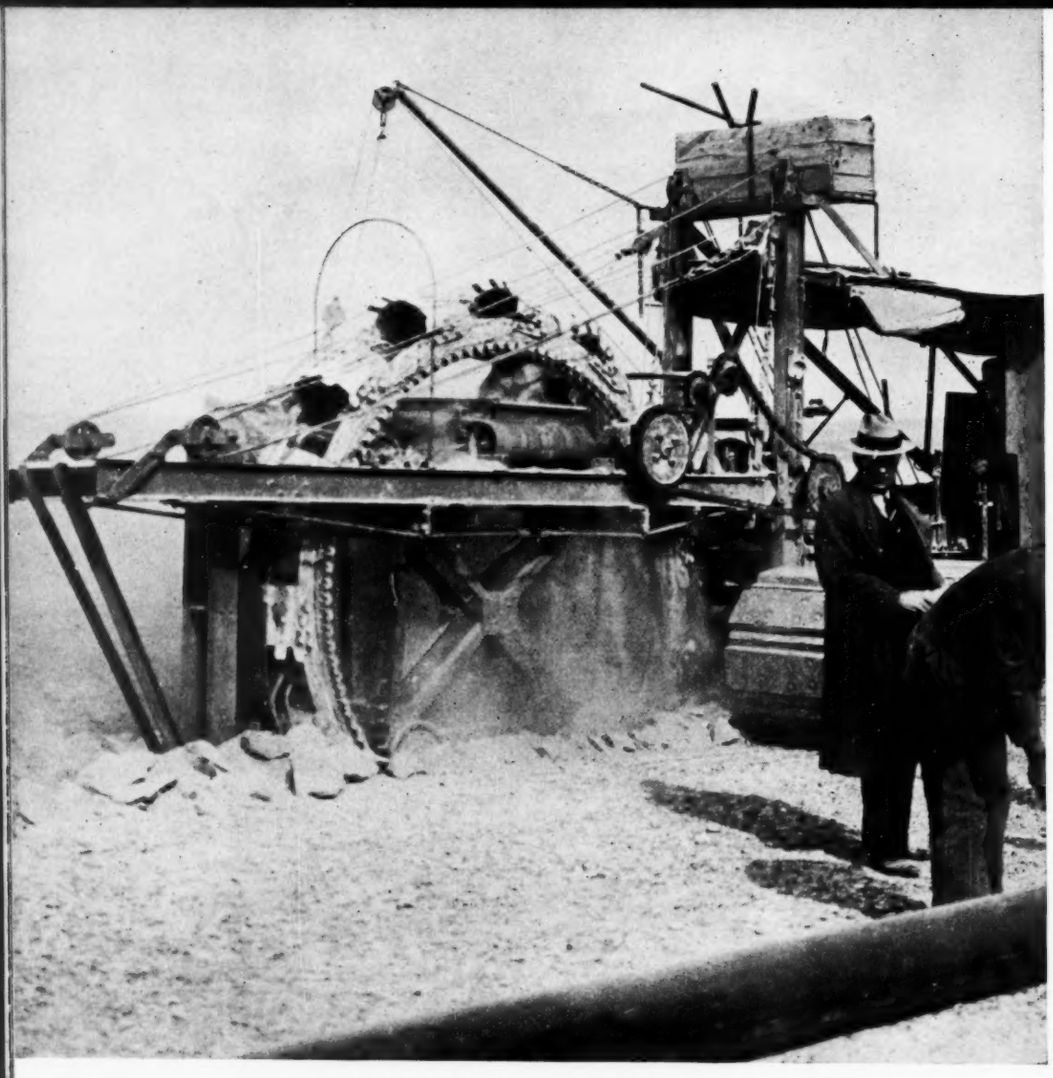
To tell the story of the Iraq pipe line in full detail would require chapters on many subjects aside from the operations involved in its actual construction. The task was in many respects unlike any previously attempted in the oil industry. In certain respects it resembled the problem confronting an army of occupation entering a strange and undeveloped land more closely than an ordinary industrial undertaking.

It was necessary to establish lines of communication, to build roads, camps, supply depots and offices, to organize a transport service adapted to local conditions for the movement of men and materials along the route, to provide sanitation, medical and hospital care, and to maintain cordial relations with the natives of the countries through whose territory the line passed by the exercise of due consideration for their rights, customs and susceptibilities. It required elaborate planning, skilful organization, careful coordination and tactful diplomacy as well as skilled engineering and extended experience.

Without attempting to describe all these various activities it may be of interest to consider some of the special problems involved in this great enterprise and refer to some of the high lights of the actual construction. To begin with it may be mentioned that the main pipe line is 1180 miles in length. For its construction more than 200,000 tons of building materials were imported and the movement of material by the company's motor transport service, aside from railway transportation, aggregated nearly 25,000,000 ton-miles. The total cost of construction was nearly £10,000,000.

In distance traversed the Iraq pipe line is not the longest in the world but in capacity and cost it stands as the greatest pipe line ever constructed as a single operation and it holds the distinction of being the most important electrically welded line ever built. Taking into account all its varied angles it must be acknowledged as one of the outstanding feats of industrial engineering accomplished in recent years.

An unusual feature of the line is that it crosses six different countries — Iraq, Trans-Jordan, Palestine, Syria, the Alaouite Territory and Lebanon. As part of the preliminary work it was necessary, therefore, to make arrangements for right of way and for the conduct of the work of construction with each of these governments, except that relations with Alaouite were handled through officials



Ditching machine in action on the desert.

Boring under the main road from Nazareth.

Boring tool emerging on the other side of the road.

of the Lebanese Republic. Later on, when the work of actual construction was under way the pipe line company followed the policy of employing, so far as it was practicable to do so, the native labor of each country for that portion of the line embraced within its territorial limits.

To handle relations with these various governments and also with the chiefs of important desert tribes the company appointed as special liaison officers men familiar with local conditions and customs. To the skill with which these officials handled their delicate and sometimes difficult tasks may be assigned the fact that the entire work of construction was carried through without any serious complications or misunderstandings in official quarters. Undoubtedly the men in charge of this part of the work could tell some entertaining tales if they felt at liberty to do so.

Both the difficulty and the cost of construction were increased by the nature of the country through which the route extends. Railheads at Kirkuk and at Baiji, west of the Tigris, provided bases at which materials for the eastern portion of the line could be delivered by rail, but all these supplies had to come in through the port of Basrah, far to the south, and to be transferred at Baghdad. By far the longer portion of both the northern and southern lines extended through desert areas in which were no towns, few inhabitants and not even a semblance of roads. Men, machines and materials had to be transported over hundreds of miles of rough and rock strewn wastes. The organization and operation of this transport service was a major task in the building of the line and is a stirring story in itself.

Strictly engineering problems in connection with the Iraq line were not markedly different from those encountered in the building of a pipe line in any remote and broken country. There were no great mountain ranges to be crossed. The highest elevation reached by the line is a little over 3,000 feet and considerable reaches of the route are practically level. The line has one unique distinction in the fact that it touches the lowest point reached by any pipe line ever laid where it descends to almost 900 feet below sea level in the Jordan valley. The problem of regulating pressure in this abrupt descent of a third of a mile is one that called for special provisions and led to the erection of the Jordan relief station as a means of controlling pressure. This is described in the article dealing with the pumping stations and their equipment.

The river crossings presented a special problem both in the laying of the pipe line and the transfer of equipment and

supplies. Because of the great variation in the volume of water in the Tigris and Euphrates and the swift current in the flood season dependence on the ordinary type of ferry was regarded as too precarious while the building of bridges would have involved an unjustifiable expense. The situation was met by the erection of aerial cableways or blondins by means of which thousands of tons of materials were safely moved across these streams. At the Tigris crossing the cables were carried by towers 140 feet high with a span between them of 1,985 feet. The Euphrates blondin was supported by towers 130 feet in height, 1,850 feet apart, and was capable of handling loads up to ten tons in weight. The main cable was 6⅓ in. in circumference and was moved by a six-cylinder Dorman engine of 100 h.p. Vehicles were conveyed across the rivers on suspended platforms and pipe was carried in slings. For the crossing of the Wadi Tharthar a causeway with three bridges was constructed.

The laying of the pipes across the Euphrates and Tigris was done according to the methods developed in American practice. Because of the roughness of the river bottoms a channel was cut for the 12 in. pipe which was of extra weight. The sections were welded together on the bank of the river and were pulled across by cables attached to tractors on the shore. A slight loop upstream was taken to allow for the influence of the current. The underwater sections were weighted with clamps to hold them in position but the pipes were not wrapped or otherwise treated.

One of the most important decisions made in connection with the planning of the line was that it should be electrically welded throughout its length. While the adoption of this method was in conformity with latest practice and had the additional advantage of reducing transport requirements there were not lacking critics who declared that under the climatic and other conditions existing in the desert it could not be applied successfully. The answer is written, of course, in the fact that out of 177,000 welded joints in the complete line only three were found to be faulty when the system was put under test.

Of the route traversed by the main pipe line about half the entire distance was normal going from the point of view of trenching and pipe laying operations. Along this part of the line mechanical ditchers mounted on caterpillar treads and equipped with a power unit driving a large bucket-type digging wheel were able to eat through the surface at the rate of a mile a day leaving a completed trench

Tractor equipped with crane lowering section of pipe into the trench

three feet deep by 26 in. wide that required only a little smoothing off at the hands of the finishing gang to be ready for the reception of the welded pipe.

The other half of the route was abundantly supplied with stones and large boulders. In places the solid rock was so close to the surface that compressed air drills had to be brought into play, drilling holes for explosives which blasted out a cut for the passage of the pipe. Nearly 300 tons of explosives were used in the course of the construction work. Where rocks were not more than a foot in diameter the mechanical ditchers were able to handle them without difficulty.

With the completion of the trench and the stringing of the pipe alongside it the scene was set for the entrance of the welding gangs. Each of these groups were headed by experts, most of them Americans who did the actual welding of the joints, while native laborers performed the less exacting tasks of handling and moving the pipe. In preparation for welding the ends of the pipe were fitted together over chill rings and the lengths so joined were laid on dollies so that they could be rotated, thus permitting the welder to work on the upward surface. Each section of pipe, consisting of several lengths welded together, was dragged by tractors to a point where it could be added to the exposed end of the completed line. For this purpose it was supported directly above the trench. In making these jointures bell-hole welding was resorted to.

After the welding was done the pipe was cleaned by a mechanical cleaner rotating about the pipe with brushes and metal cutters. Next a bitumastic primer was applied and over that enamel was spread by the dope gang. Asbestos felt wrapping was then wound spirally around the pipe.

Following this treatment tractors equipped with winches and cranes picked up the lengths of attached pipe and lowered them into the trench. The length of the pipe in all cases was a little greater than the length of the ditch in which it was to rest so that there was no possibility of the sections pulling apart under extreme changes of temperature.

After the pipe was laid in the trench the tractors covered it by a process of backfilling in which scoops or shovels mechanically operated pulled the loose earth into the trench until the latter was filled.

With the thousands of sections of pipe united into one continuous line and buried in the trenches under its protective covering it was ready to fulfil its function of conveying oil from its source in the fields to the marine terminals.

The submarine portions of the lines connecting with the offshore loading stations were placed in position in the same manner as the sections crossing the rivers. The necessary lengths of pipe were welded together on shore, mounted on dollies and then pulled into position by a tanker especially equipped for that purpose.

From the time when the first work of placing pipe in position at the Tigris and Euphrates crossings was begun until the final step in completion of the stringing, welding and laying of the line was only fourteen months. To span within this time a desert area devoid of all ordinary facilities and aids to work of this sort with more than a thousand miles of steel pipe, scientifically and accurately placed and equipped for its assigned purpose, must rank as a noteworthy feat of construction. To those unfamiliar with the extent to which mechanical equipment has been adapted and perfected for the performance of the heavy tasks involved the achievement seems almost unbelievable.

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Physical Features of Iraq Pipe Line

In the construction of the Iraq pipe line 12″ pipe is employed for the greater part of the trunk line system with lesser quantities of 10″ and 8″. Of the 1,217 miles of main line 1,012 miles consist of 12″ with 191 miles of 10″ and 14 miles of 8″. The 8″ pipe is used mainly to reduce gravity pressure on the sharp descent into the Jordan valley on the southern line. The 10″ is installed near the pumping stations while the 12″ comprises the long stretches between the stations.

Specifications for the pipe provided that it was to be of seamless steel in lengths of 36′ to 40′, bell ended to be welded end to end over a chill ring. The 12″ size is of 0.33″ thickness and a weight of 43.733 lbs. per lineal foot and accommodates a maximum working pressure of 700 lbs. per sq. in. The 10″ pipe is 0.307″ in thickness and weighs 34.24 lbs. per foot. The 8″ pipe has a thickness of 0.322″ and weighs 28.554 lbs. per foot. Pipe of heavier weight was used for submerged sections of the line or where exceptionally high pressures were to be met.

Pipe of the 12″ size was supplied by French, British and German manufacturers, that of 10″ size by American, British and German firms and the 8″ by a prominent British firm. In addition to the requirements of the trunk line system it was necessary of course to provide pipe for the gathering system in the fields, for tank and terminal connections and to handle the water supply at certain points.

Gate valves are installed at the points where the size of the pipe changes and at the river crossings of the Tigris, the Euphrates, the Orontes and the Nahr al Kabir on the northern line and the Jordan on the southern.

Other equipment for the operation of the line, aside from the pumping stations which are separately described, includes tanks, service units for housing the permanent staff, supplies and stores, telephone, telegraph and wireless facilities, water lines and storage, and landing fields for airplanes at each of the stations.

Three degassing units near Kirkuk prepare the oil for movement through the pipe line. There are fifty-four tanks of various sizes of which thirty are located at the water terminals. At station K-1, at the head of the line are four 70,000-bbl. tanks and two 93,000-bbl. tanks and at K-3 where the line divides are one 70,000- and two 93,000-bbl. tanks. K-2 has two 30,000-bbl. tanks. Each of the other stations has one 30,000-bbl. tank with an additional tank of similar capacity at one station on each of the two single lines. Two similar tanks are located at the Jordan River relief station. All of these tanks are equipped with floating roofs.

The head of the pipe line at Kirkuk is at an elevation of 1,008 ft. From this point it gradually descends to the Tigris which is crossed at a distance of 53 miles at an altitude of 342 ft. Thence across the plain to the Euphrates is a distance of 95 miles. Haditha, where the line bifurcates, is 150 miles from the starting point.

After leaving this junction point the northern line climbs gradually to an altitude of about 1,000 ft. and follows a fairly level course across the Syrian desert. After crossing the Orontes the line dips sharply on its approach to the coast and arrives at the Tripoli terminal, 532 miles from Kirkuk.

The southern line traverses a district that is more broken. After leaving Haditha it climbs to hilly country and reaches its highest elevation, 3,167 ft., in Trans-Jordan, 451 miles from the starting point. From the crest of the hills east of the River Jordan it drops sharply to 885 ft. below sea level which is the lowest point on the line. From here it ascends the western slope of the valley and at the Haifa terminal is 621 miles from the head of the line.

Transport's Great Part in Iraq Construction

Movement of Materials and Supplies Aggregated 23,000,000 Ton-Miles and Distance Covered by Motor Fleet was 18,000,000 Miles—Difficult Terrain.

By J. F. Winchester

Manager General Automotive Division, Standard Oil Co. of New Jersey

IT HAPPENED to be the writer's good fortune to receive an assignment to visit the Iraq pipe line while construction was under way for the purpose of acting in an advisory capacity to those in charge of the operation and in order to accumulate experience from intimate contact with an outstanding operation which could be made available to our various transport interests.

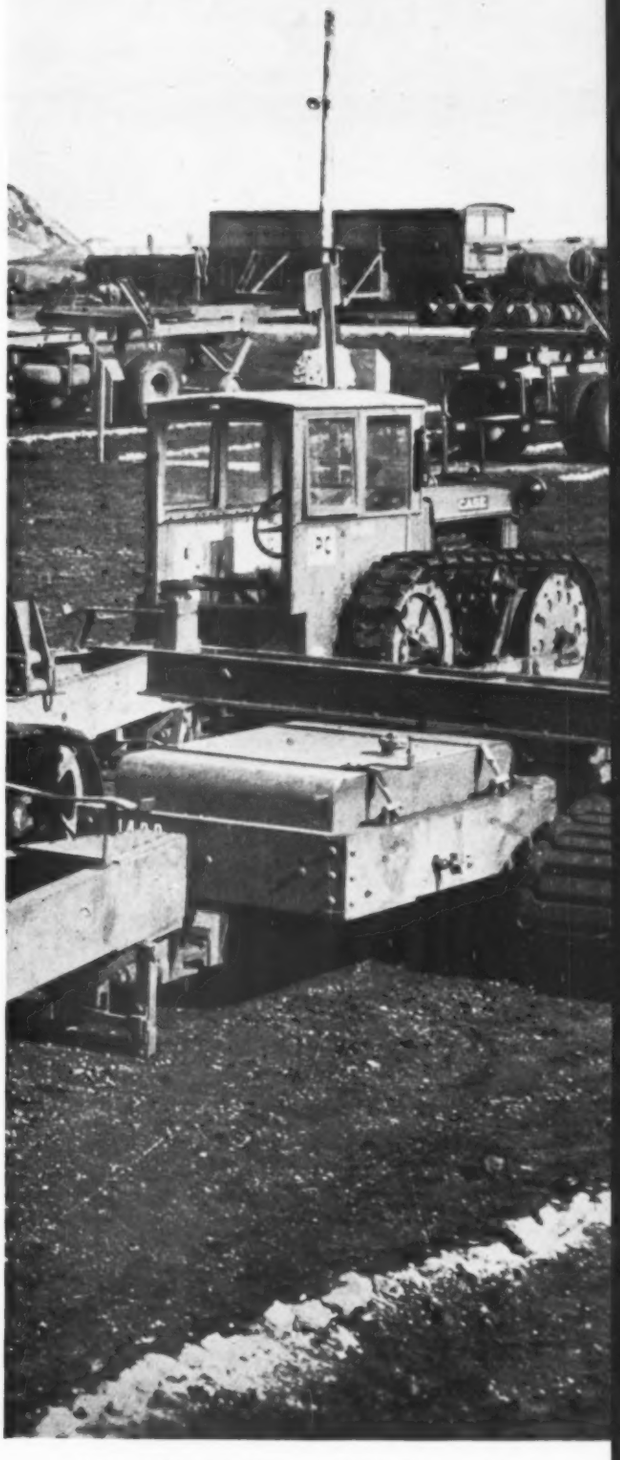
The average transport man can hardly realize without months of study the problems that the men in charge of this operation encountered in order that another mode of transportation, namely, pipe line, might be assembled for the movement of oil from and through a land rich in Biblical lore. Considering Biblical history and stories from the Arabian Nights, we are apt to visualize a land of milk and honey but actual contact with it gave mute testimony to the devastations of man and time which have left behind them ruins of ancient cities, terrible climatic and topographic conditions which few transportation men in civil life really meet. Only the motor transport branches of the armies of the civilized world are designing and buying equipment to meet such conditions.

When I arrived at Haifa, the undertaking was well under way. Many tons of material of all types had been moved; worn out motor equipment was being displaced with new, and all branches of the transport activity were at full height. I found functioning a well organized transport department which consisted of chief transport superintendent, traffic superintendent and vehicle inspectors. This in turn was broken down into divisional transport departments functioning under the supervision of Mr. L. W. Chuter and Mr. R. A. Bampton. These two men were responsible for the movement of material by motor transport and the inspection and maintenance of equipment and also the operation of the repair shops.

The stupendous task of these men may best be visualized when we consider the fact that it was necessary for them to start afresh on an entirely new operation. It was necessary for them to work out the details in connection with vehicles to be purchased, personnel to be employed, the actual installation of repair shop equipment and then the recruiting of native drivers and their training in the field. The task was further complicated by these men being called upon to employ the nationals of those countries through which the pipe line operated. In many cases this necessitated changes in personnel when the work went from one country to another. The principal countries involved were Palestine, Trans-Jordan, Iraq and Syria.

The majority of the personnel had never seen or operated automotive equipment before and their training was complicated through the fact that they spoke in a dialect of their given countries which made it necessary for an interpreter to become a go-between in many instances between the instructor and the men who were to operate the vehicles. On the whole, however, these operators improved rapidly under the training and discipline of their instructors and did a very good job in operating the vehicles when actually placed in transport work. We must not overlook the fact, however, that even with men who are well educated, when trying to do a given job, their work is far from satisfactory in many instances and this proved to be equally true in this particular operation with the result that costs on some individual vehicles were far out of line with others of similar makes.

The fleet which I encountered included



Various kinds of transport equipment seen in a partial view of an Iraq truck depot.

Comparatively rapid transportation of huge loads of pipe for the Iraq pipeline

approximately 500 automotive units with a large quantity of trailer equipment and the repair shops were called upon to take care of this as well as many other types of machinery which was used for various purposes in the construction of the pipe line and the pumping station.

The seriousness of the conditions under which the vehicles had to operate can be best described by stating that the terrain was virtually a desert in which varying types of soil and land conditions were encountered. In one country, namely, Trans-Jordan, there was encountered what is known as lava rock. The vehicles had to operate for a considerable period of time over this rock which threw off a dust that was emery-like in substance and resulted in rapid cylinder wear. Because the rocks were from 4″ to 18″ to 20″ in diameter, the tire and chassis wear was very rapid. In other sections of the desert were encountered soft sand, in other sections limestone, and throughout all sections water was sparse. To make things worse, climatic conditions of unusual severity were encountered. In mid-winter the temperature is below the freezing point, while in summer at the time I was there, it maintained a shade temperature of 120°, and for weeks on end the temperature, I am given to understand, varies between 105° and 120°. Great variations of humidity and dryness of atmosphere occur because in one section of the country we are near the Mediterranean and in another section near the Sea of Galilee, in another section the Tigres and Euphrates Rivers, while in the desert, itself, there is found no shelter of any kind to protect one from heat or cold. High winds are common and with these high winds severe sand storms were encountered. During the duration of these sand storms in one thousand miles of operation transport personnel would remove

Tractors and trailers for heavy loads in rough desert going.

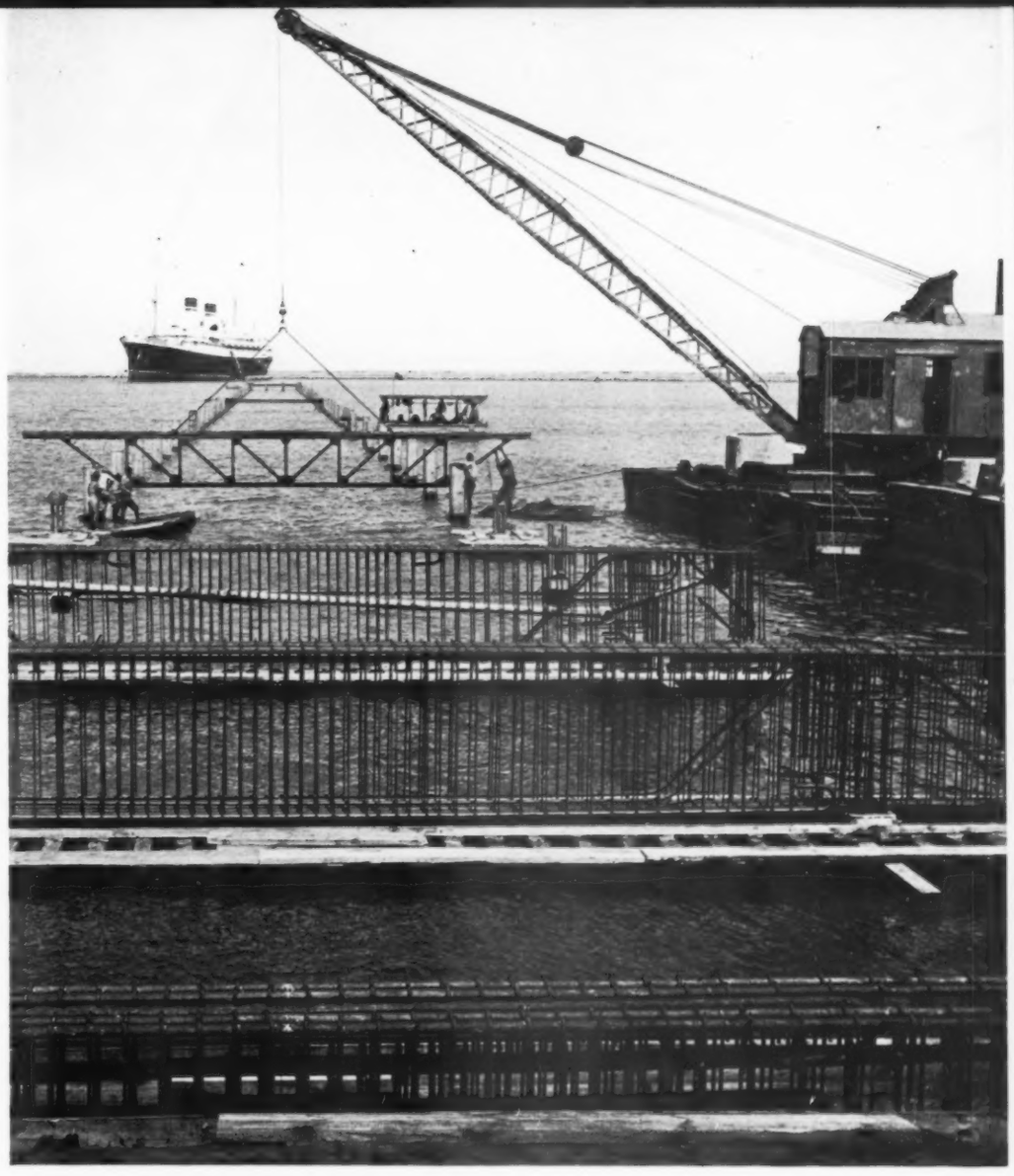
from the air filters 22 to 32 ounces of solid matter. At other seasons of the year bad rain storms are encountered which render the surfaces of the desert in places completely impassable. All of the above conditions were particularly embarassing to the motor transport department and more particularly so to many vehicles of the rear wheel drive type.

In the operation, itself, I found a large variety of units. They were of English, French and American make. Each particular type seemed to have certain individual features which if they could have been built into a composite vehicle would have resulted in an ideal unit being constructed for the type of conditions which were encountered.

The six wheel Scammells had a very fine type of rear axle construction which enabled them to negotiate the lava country better than many of the others. The A. E. C. Hardys, Colemans, Marmon-Herringtons and the Four Wheel Drives employed four or six wheel drives which gave them traction and certain advantages which the rear wheel drive vehicles did not possess. Certain types of vehicles were fitted with the Clayton Still type of radiator which was particularly adaptable to the severely hot climatic conditions encountered. The International-Harvester units were fitted with the Miller air filter which eventually became the standard type of air filter for all of the vehicles in operation. The fact that it draws the air through a fluid medium and has a large capacity for dirt made it an outstanding unit to handle the abrasive dust which would be drawn with the intake air into the engine. Steel bodies proved their superiority over wooden bodies, while the Westinghouse air brake system used on many of the American trucks proved its superiority over the best of mechanically operated brakes.

The actual repair and maintenance of the vehicles was performed by both the unit and overhaul repair shop methods, and the unit system in particular gave a very good answer for itself. When we consider that this operation was located thousands of miles away from main sources of supply and we recognize the difficulties that the average transport man encounters in obtaining parts from factories close at hand, it can best be seen that this problem was multiplied many times by the distances involved which called for a good reserve as well as an efficient stock keeping system.

Repair shop and stock keeping facilities were of two types. At headquarters, such as Haifa, a permanent installation was made, while in the desert itself, it was necessary to have mobile work shops that were mounted upon large drop frame trailers fitted with power and lighting systems, lathes, air compressors and other equipment such as welding apparatus, which accompanied the complete force. The mobile repair shops were a special feature made necessary by the fact that as the work progressed it was necessary to transfer the repair work near to the actual point of construction. These shops proved of extraordinary value for through them temporary transport concentrations were more efficiently served than would have been possible if a permanent shop had been built in each instance. They were equipped in such complete detail that they were able to perform all types of maintenance services under the arduous conditions which were encountered.



Building an oil wharf at one of the ocean terminals of the great pipe line at Haifa.

A complete tire repair shop was located at Haifa which contained the most modern equipment manufactured by the Dunlop Rubber Company. This was operated by specialists and proved to be a distinct asset in the maintenance of tires. It might be interesting to record that tire life under these arduous conditions were as follows: in the passenger car classification the average life was 9,050 miles; in the light duty truck classification, the average life was 8,350 miles, while in the heavy duty vehicle classification, the average life was 11,850 miles.

In addition to the fleet used for hauling the heavy material, it was necessary to maintain a fleet of light trucks which consisted largely of Internationals that assisted in the construction of the telegraph and telephone lines. There were in this fleet a large number of ambulances, complete mobile dental parlors mounted on chassis, as well as light and heavy passenger cars for the transportation of per-

sonnel to and from the various duties assigned to them.

Other fleet statistics which might be of value to those interested in motor transport work are as follows.

The fleets employed exclusively in connection with the main haulage work operated 4,850,000 miles in transporting overseas and local materials which, together with water and petrol, involved a tonnage exceeding 430,000 tons. This tonnage total was composed of pipe, 29 percent; pipe-protection materials, 2 percent; telephone and telegraph materials, 1 percent; petrol and water, 8 percent: stone, sand, gravel, 47 percent; engineering and station materials, 13 percent. The ton-mileage involved exceeded 23,000,000, with a monthly total, for half a year continuously, of between 1,500,000 and 2,000,000. The percentage distribution of ton-mileage was as follows: pipe, 52; telephone and telegraph materials, 3; enginering materials, 22; liquids, 9; miscellaneous, 14. Apart from main haulage work, the provision and operation of fleets of light trucks was necessary to deal with the various classes of service work connected with construction. Fleets thus employed operated for over 4,500,000 miles. Passenger cars and light pick-ups for the transportation of the supervisory staff ran 8,400,000 miles. Up to the end of May 1934, nearly 18,000,000 miles had been run by units of the company's transport fleet as a whole, of which the main haulage fleet was responsible for 28 percent, service trucks for 25 percent, and the passenger fleet for 47 percent.

Finally, some totals of constituent elements in the company's fleet may be given. In November 1933, 137 passenger cars, 81 pick-ups, 137 light or medium trucks, and 108 main haulage vehicles were in operation—a total of 463. The corresponding figures for April 1934 were 130 passenger cars, 76 pick-ups, 124 trucks, and 97 general haulage vehicles, totalling 427. At the latter date, however, 73 of these, including 59 general haulage vehicles, were laid up on completion of duty.

It is believed that not only the size of this fleet, but the power and quality of the more important units of which it was composed, their successful operation and maintenance, and their performance under quite exceptional conditions, may well entitle the motor transport side of the Iraq pipe line enterprise to a very high place in the history of industrial transport organization.

I have stated that the operation was a most arduous one. It is fortunate, however, for truck manufacturers in general that the management of the project placed at the disposal of manufacturing, engineering and service personnel throughout the world complete detailed information as to the kinds, types and variety of mechanical difficulties encountered with individual vehicles. This has given the manufacturers a complete history of their individual units that no doubt will lead to improvements in design which will benefit the science of motor transport haulage.

Aside from the pipe line construction, itself, it was gratifying to note in Palestine, Iraq and Syria the gradual introduction of motor transport work as a part of every day life. Motor buses were in general evidence and the use of the light car and truck seemed to be extending itself into various branches of commercial life and industry. No doubt as time goes on and the prosperity of these countries continues, the opportunities for further installation of various types of equipment will be created.

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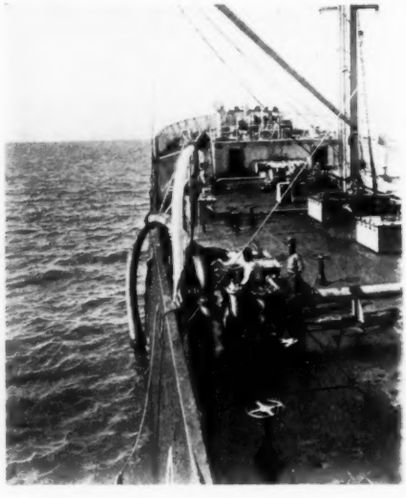
Mediterranean Terminals of the Pipe Line

IN ANTICIPATION of the coming of the Iraq pipe line and also to provide port facilities for other kinds of trade the government of Palestine has constructed extensive harbor works at Haifa. This has included extensive dredging, the building of concrete breakwaters, the construction of piers, basins and service facilities. Incorporated in the main harbor works is an oil dock which is protected by a main jetty 1,485 ft. long and a subsidiary jetty 485 ft. long, both of reinforced concrete. Entrance to the oil basin is guarded by a movable steel boom 330 ft. in length. The depth of water in the dock is 33 ft. and space is provided for four 500 ft. vessels to load at one time.

A site directly adjoining the main jetty is reserved for the Iraq Petroleum Company where a pump house, manifold chambers and fire-fighting apparatus will be established. Close by is located a tank farm on which five 93,000-bbl. tanks are to be erected and pipe lines connect this station with the main terminal which includes an enclosed area of 214 acres on the sand dunes outside the town. Ten tanks of 93,000 bbl. capacity occupy this site together with the offices, stores and workshops needed to serve as headquarters for the southern division of the pipe line.

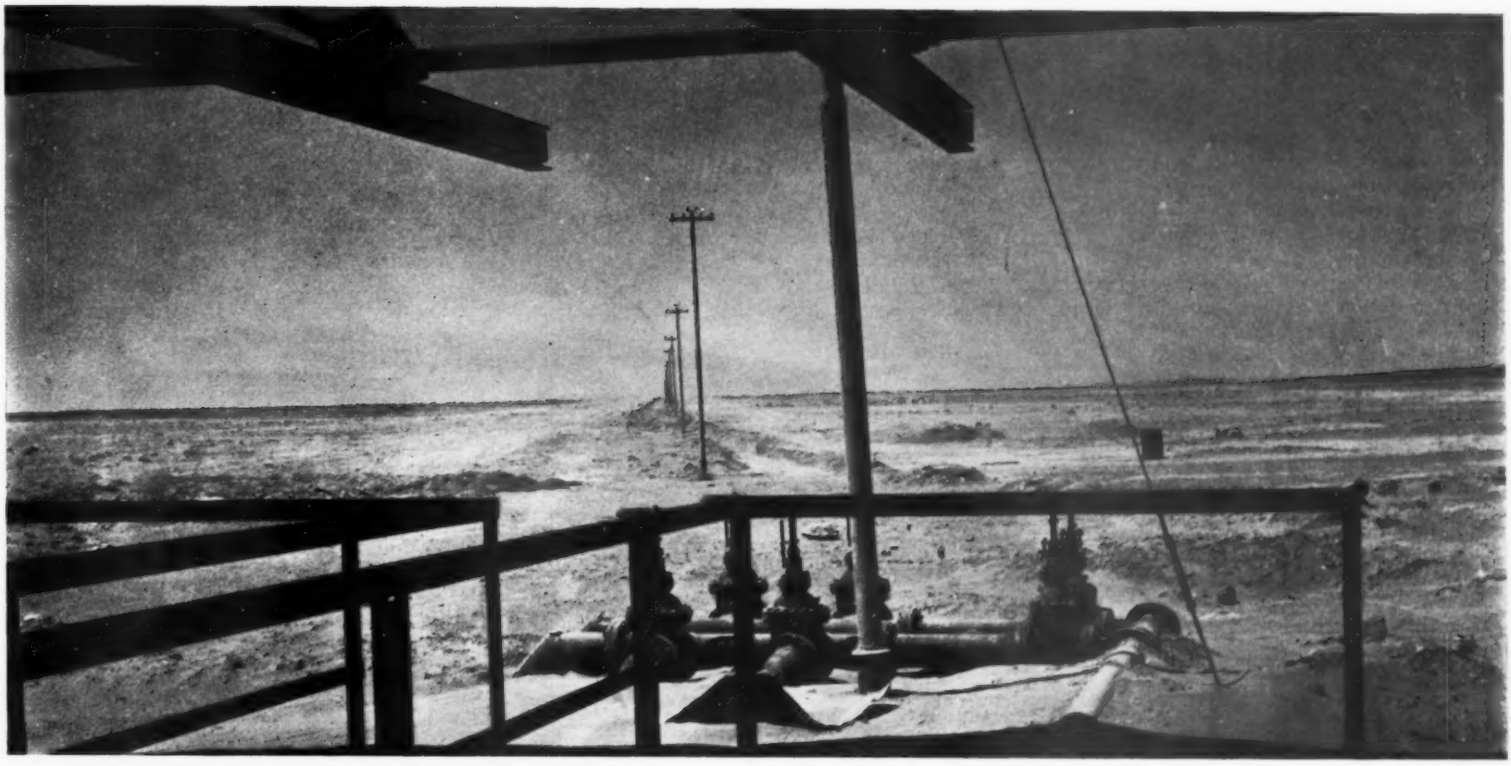
Tanker loading one of the first cargoes of Iraq oil through the flexible marine line.



Two sea lines extending 4,200 ft. from shore and spaced about a half mile apart serve as a marine terminal where tankers can load without coming into the harbor. Each station is served by a 12″ submarine pipe line connecting to two 8″ hose lines through which loading can proceed at 1,000 tons per hour. A cable telephone line connects the marine terminal with the shore station and pumping operations are directed by remote control of signals within the manifold building.

At Tripoli all loading takes place at a marine terminal consisting of three berths with a 50-ft. depth of water. These berths are at distances of 4,400 to 5,470 ft. from shore and each is served by a double 12″ line of pipe reduced to 10″ at the loading point. Pumping is not necessary as the land terminal is located at an elevation of 220 ft. and the oil flows to the tankers by gravity. A suction pump and manifold are provided, however, for the purpose of withdrawing oil from the sea lines if necessary. Loading through these lines takes place at the rate of 1,000 tons per hour.

Storage facilities at Tripoli consist of fifteen 93,000-bbl. tanks located on an elevation a short distance back from the shore and a transfer pump station and manifold situated just below these for the purpose of moving the oil from tank to tank. Such inter-tank transfers can be made at the rate of 500 tons per hour.



Telegraph and telephone lines across the desert from the pump station at Palmyre.

Creating an Iraq Communications System

Tremendous Task of Stringing a Thousand Miles of Telegraph and Telephone Wire Across the Trackless Desert Pushed Through Rapidly to Serve in Work of Pipe Line Construction. By W. T. West*

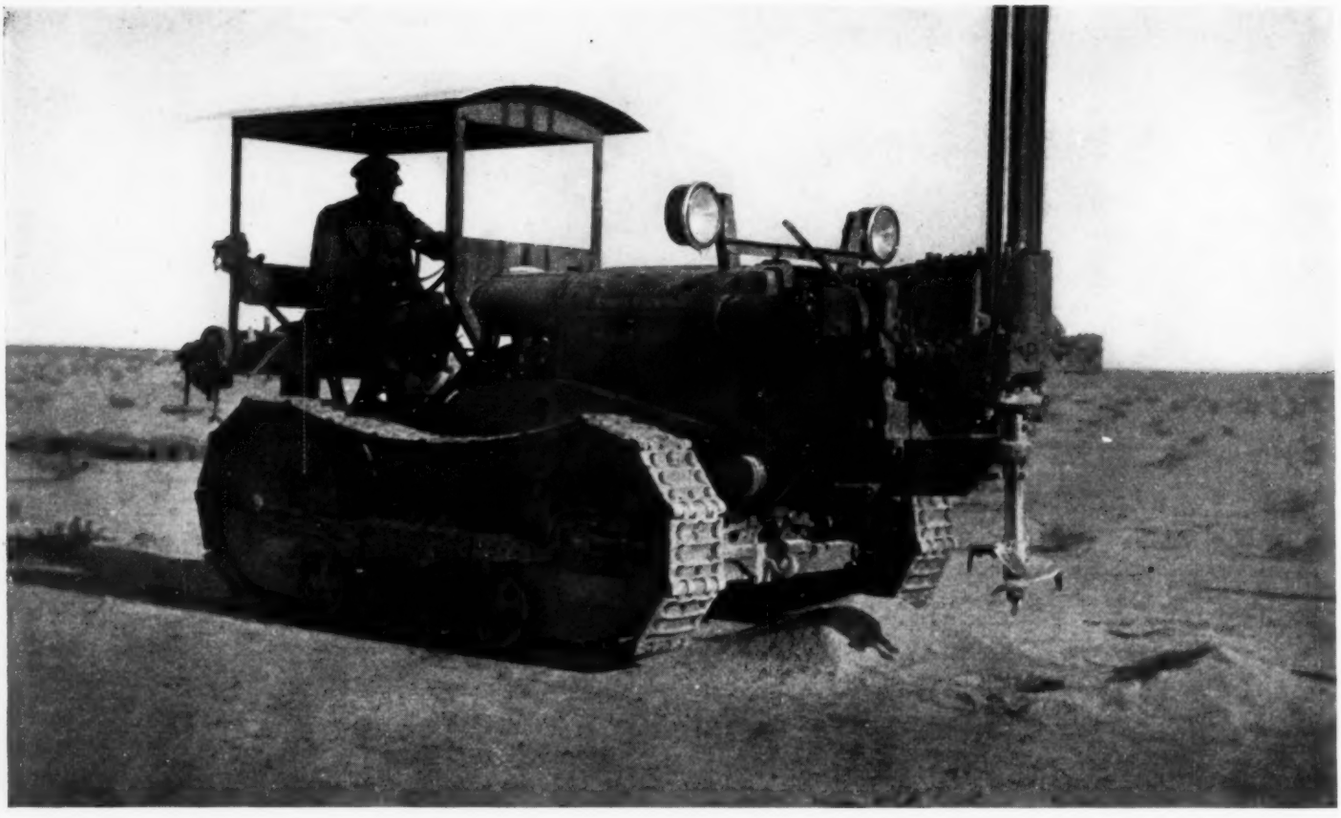
THE project of constructing a telegraph and telephone system along the route of the Iraq pipe line, from Kirkuk to Haditha and thence in two sections from Haditha to Tripoli and Haifa on the Mediterranean, presented many difficulties and problems not ordinarily encountered in work of this nature and of which a mere description of the route followed in the thousand mile course of the line gives no inkling. There were many aspects to the building of such a line seven feet on the southern side of a track fifty metres wide along which a pipe line was to follow 18 feet to the south of it that made standard practices impossible. Many points had to be considered and many decisions made before the actual estimating for both internal and external plant was taken in hand.

*Mr. West was the engineer in charge of construction of the telephone and telegraph systems of the Iraq Petroleum Company.

The whole objective of telephone and telegraph construction was to drive ahead of all other work, thus providing a means of communication over the system for the eventual pipe line, water line and water well drilling gangs, transport convoys and station construction gangs, which would eventually follow throughout the system.

Therefore, the usual practice of staying the route, wind and line, had to be abandoned, as obviously stays would be an endless cause of trouble to the motor transport proceeding up and down the line and to the transport engaged on pipe line operations. This affected the pole design and entailed the designing of a special cast iron base, spigoted 8″ from the tip, to take a heavier taper, so that the use of stays, wind and line, was avoided and the route stayed at angles only, of which there were but few. The soundness of the design has been proved during last winter's rains, as throughout the system very few poles moved and the route stood intact, even during the severe inundation of the Wadi Thartar, approximately halfway between K.2 station and Haditha.

It was finally decided to build the route



This post hole digger attached to a tractor shortened the time used in construction of the all-important communications system.

Stringing telegraph wires in the Emek valley.

with Standard British Post Office pattern plant and this decision allowed estimating engineers to proceed with their work, which commenced in March, 1932, and was completed in May. The majority of the orders for the external line plant and internal apparatus was placed during this month with the manufacturers. Estimates for construction tools, transport, especially equipped International trucks and mechanical post hole diggers for telegraph construction, together with tankage for water and petrol supply, tentage, camp equipment and personnel were all completed by June, 1932. The construction personnel left the United Kingdom, concentrating in Haifa, in July. A school was formed immediately at Haifa for the instruction of native personnel in British methods of construction, and native headmen were trained to act as keymen with the gangs when the actual work went forward.

It was planned that five gangs should commence the work of construction. Two of these were placed on the southern line, working from Haifa via Mafraq through the lava country to Haditha. One gang started from Kirkuk, working down to Haditha and thus along the southern leg towards Haifa. Another began at Tripoli on the northern line, working eastward to Haditha, while the fifth operated from Haditha westward toward Tripoli.

The gangs were equipped with tentage, transport, tools, and key personnel at Haifa, and proceeded to their respective locations in August, 1932, commencing actual construction on the first of September, 1932.

The rate of progress aimed at was one complete mile of construction per day, and as eventually shown, in practice this was far exceeded. The line consisted chiefly of 25′ overall poles, sunk 4′ 3″ carrying one Australian carriwood arm, with four 300 lb. Cadmium copper wires. Owing to the extreme temperature ranges in the countries through which the route passes it was decided that Cadmium copper was more suitable than hard-drawn copper.

The gangs in the north and east had the better ground for construction purposes, and there were not many natural obstacles on the way from Kirkuk to Haditha. In these circumstances good progress was made in those areas.

In the south it was a different matter. From Haifa through the Emek valley to the rising ground on the west bank of the Jordan, the going was fairly good. The rise over the Kirkub Howah and fall into the Jordan valley presented some difficulty and all plant had to be manhandled. From the east bank of the Jordan the ground consisted of sheet rock and blasting had to be resorted to. Good country again was encountered for a distance of approximately 20 miles east of Mafraq and then the lava country was entered. For the next 110 miles all pole holes had to be drilled and blasted.

Erecting a telegraph pole on the route of the Iraq pipe line.

Communications system completed and in operation while a ditching machine works in the early stages of the pipe line construction.

There was some excitement in the broken country about Wadi Rutga and Wadi Swab during the rains, the transport feeding the construction gangs becoming bogged, necessitating all line plant to be manhandled across the fast flowing wadi. It says a good deal for the transport, medical, commissariat, and other departments when it is stated that hold-ups were of very rare occurrence and sickness practically nil, and that the route Kirkuk-Haifa via Haditha was linked up in April, 1933 and the northern line, Tripoli-Haditha, was linked up a few weeks afterwards.

Telegraphic communication was immediately established and the organization which had been commenced months previously to deal with traffic, was put into practice for both telegraph and telephone communication. At the present time the telephone and telegraph department is dealing with 2,900 messages per week over the whole system with 1,800 in and out of the Haifa telegraph office alone. Telephone trunk calls are dealt with at the rate of 2,000, in and out, per week. Telegraph offices, maintaining a twenty-four hour continuous service, are working at the following stations and depots:

Eastern Division	Northern Division	Southern Division	
		1.	2.
K.1	Haditha	Haditha	Haditha
Baiji	T.3	H.3	H.4
Haditha	T.4	Haifa	H.5
	Homs Depot		Mafraq Depot
	Tripoli Depot		Haifa

The bulk of the personnel staffing the different offices throughout the system has been trained in the company's telegraph school, Haifa, which was established prior to the linking up of the whole system. The students of the school are nationals of the countries through which the route passes.

Telephone exchanges are operating at:

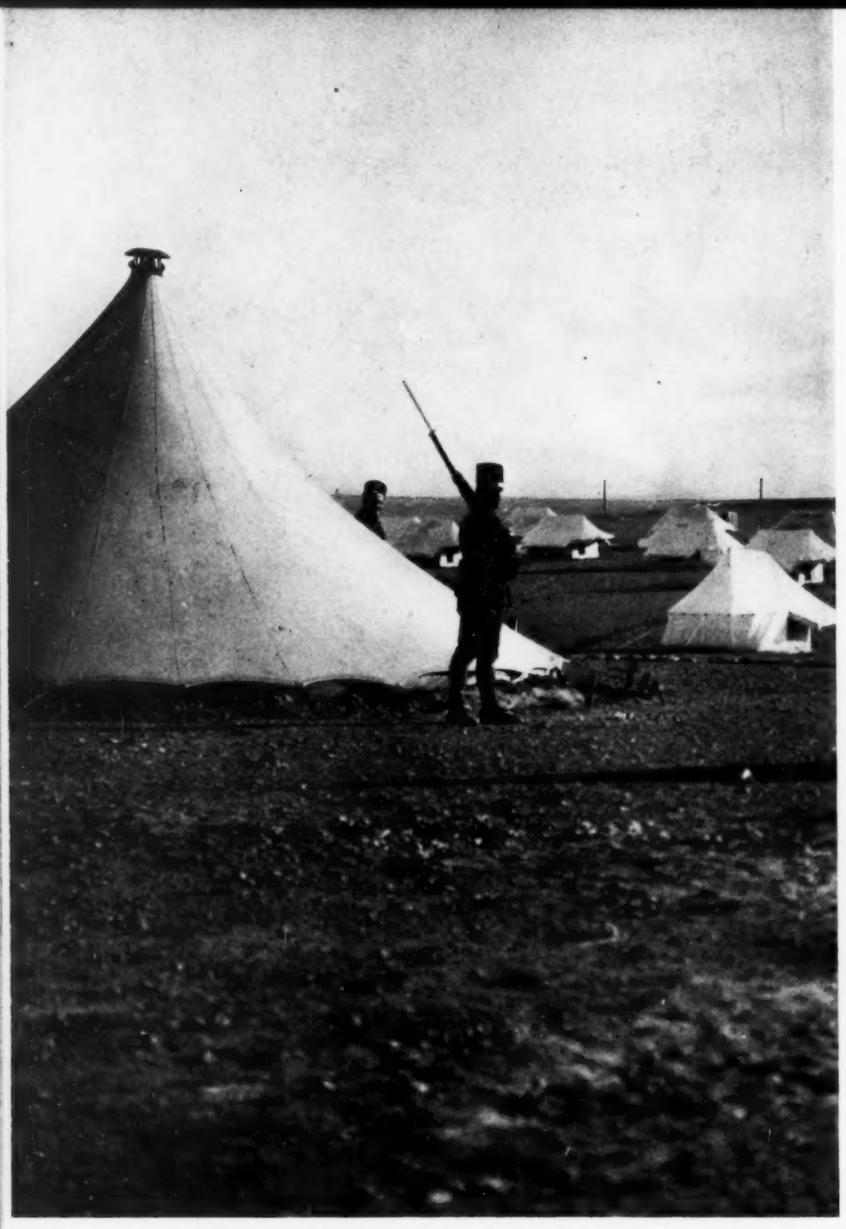
Eastern Division	Northern Division	Southern Division
K.1 Station	Homs Depot	Haifa
Baiji Depot	Tripoli Depot	Mafraq Depot
Haditha Depot		

Unfortunately, owing to blasting operations, speech transmission was frequently interrupted on the long distance trunk Haifa-Haditha. Since the completion of blasting operations speech transmission has been excellent.

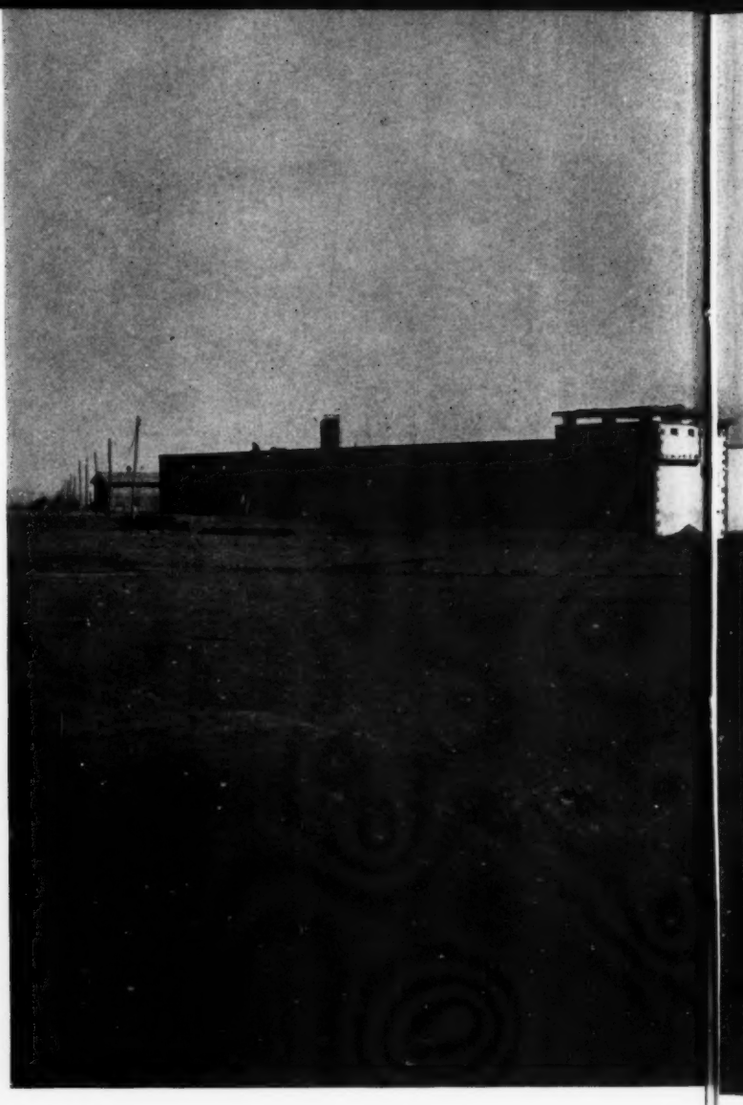
The form of communication first established was purely of a temporary nature, being carried out with portions of the permanent Voice Frequency equipment, which did not come into operation until the oil stations were completed. The permanent Voice Frequency automatic equipment, supplied by the Automatic Electric Company, Liverpool, is the most up-to-date and modern telephone and telegraph equipment extant. Four physical channels are provided over the two loops, namely:

1. Through telephone
2. Intermediate telephone
3. Through telegraph
4. Intermediate telegraph

A further telephone channel super-



Between Homs and Palmyre: the orderly, clean camps contributed to the high standard of health.



A desert fortress.

imposed over the two existing loops can be obtained, if necessary. The most modern valve repeating equipment is being installed in Haditha, thereby insuring efficacy of speech transmission from Tripoli—via Haditha to Haifa, a distance of approximately 860 miles, or Haifa-Haditha-Kirkuk, a distance of approximately 540 miles, or again Tripoli-Haditha-Kirkuk, a distance of 520 miles.

Telegraph communication is obtained over the loop and no earth circuits are in use, assuring non-interference of the telegraph channels by static storms.

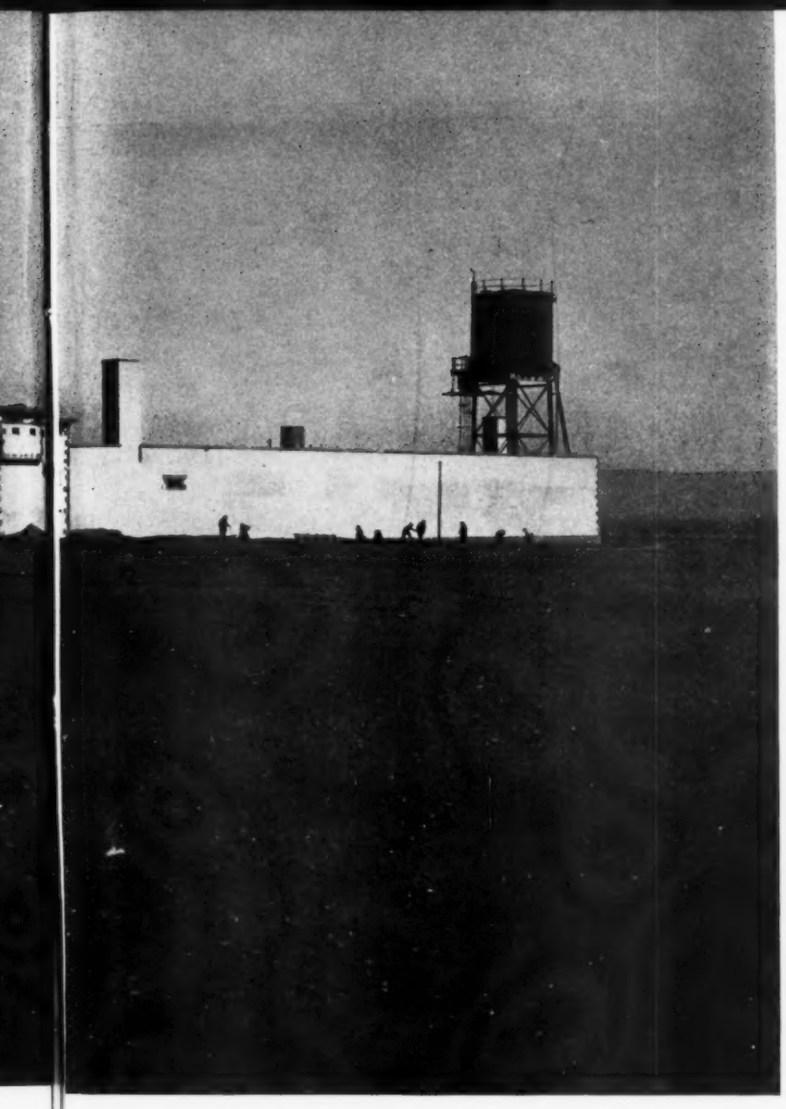
The maintenance of the line is undertaken by skilled personnel, chosen from the original construction gangs. The method of transport is camel and horse, reinforced at key positions with motor transport for fast fault clearing service.

The following figures will give some idea of the enormous external main line plant involved, including light line plant. Besides 1,110 miles of main line construction, approximately 150 miles of light line circuits of 70 lb. Cadmium copper wire were erected to give communication between the different water wells and pumping stations. This material in every respect is of the same specification as the main line, but of smaller dimensions.

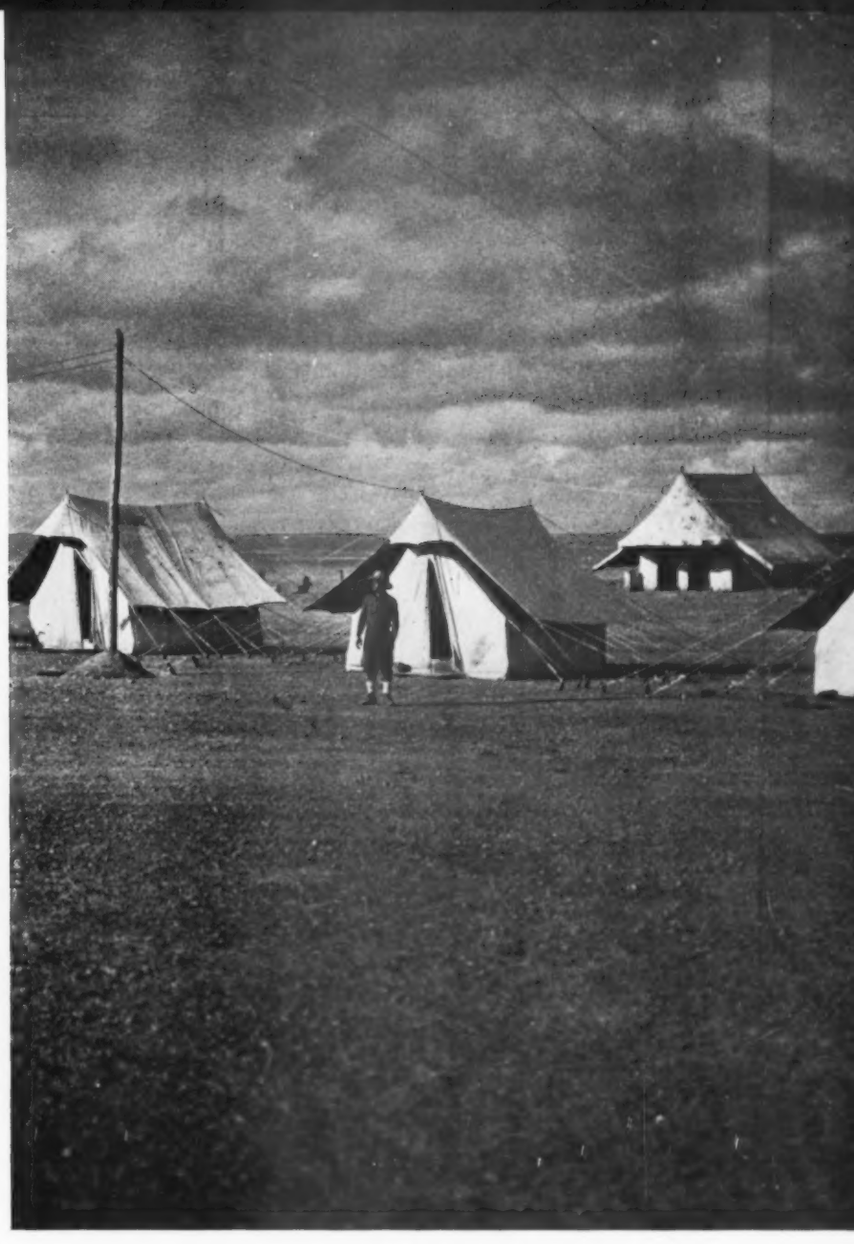
Item	Main Line	Light Line
Tubes	26,500	5,000
Bases	26,600	5,000
Spindles	125,000	10,000
Insulators	140,000	17,000
Crossarms	33,000	5,000
Combination brackets	33,000	5,000
Wire, Cadmium copper 300 lb. per mile	700 tons	.....
Wire, Cadmium copper 70 lb. per mile	.....	21 tons
Tapes and binders	250,000	27,000
Sleeves	17,000	1,600

High Standard of

In a construction enterprise requiring the employment of thousands of men under strange and trying climatic conditions and in a territory where absence of towns made ordinary facilities for dealing with disease or injury unavailable careful provision for medical attention and sanitation was obviously needed. The Iraq Petroleum Company prepared for this by the creation of a medical service with a chief medical officer at its head, district directors to supervise the northern, southern and eastern divisions, and assistant medical officers in charge of dressing stations with the construction gangs, at depots and at main line stations. The posts of pharmacists and orderlies were in many cases occupied by natives. Motor ambulances were provided and a traveling clinic was established to look after the dental needs of the workers.



Protection along the route of the pipe line.



A temporary camp for pipe line workers in Syria.

Health Maintained

A company hospital containing 26 beds already was in existence at the field headquarters at Kirkuk when the building of the pipe line began. Another of like capacity with a small operating theatre was erected at Haditha. Detention wards were established at each of the pumping stations and at Homs, Mafraq and Baiji. Arrangements were made also for the use of facilities in existing hospitals at Baghdad, Amman, Haifa, Beirut and Tripoli. Hospital tents and equipment were held in reserve for instant use in case of an outbreak of infectious disease, at any point.

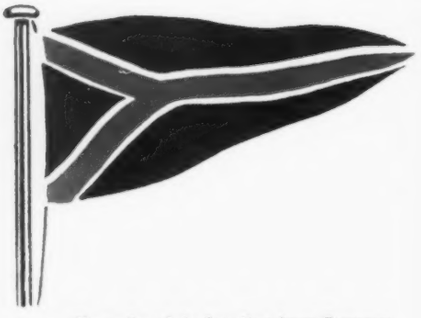
Fortunately these provisions proved more than adequate. The careful examination of all applicants for positions before they were accepted and the frequent and thorough inspections insisted upon during the work prevented any serious outbreak of infectious disease, while injuries were mostly of a minor nature and were confined largely to the transport service, and the handling of heavy stores and equipment.

The total number of cases treated in hospital during the building of the line was less than 2,000, by far the greater number of which were dealt with in the company's own hospitals. Of the serious diseases which are more or less prevalent in the regions traversed by the pipe line the company's forces were almost entirely free. There were no cases of cholera, only one each of smallpox and plague, only two of typhus and only 22 of typhoid fever. Time lost through illness was less than half of one percent and through accident only a trifle over half of one percent of the total man-days of employment.

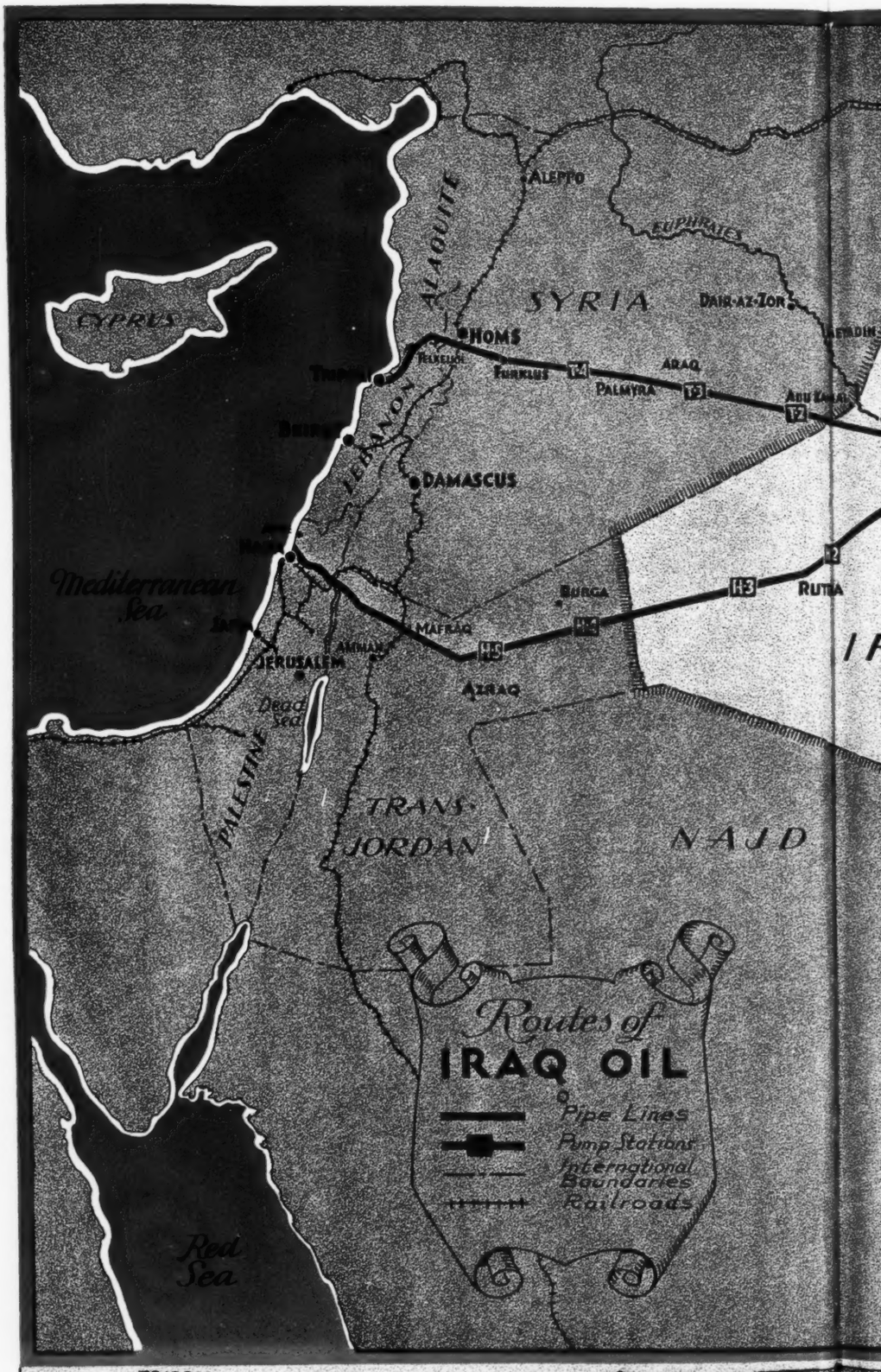
For the use of the pipe line gangs as they moved from camp to camp medicines and sanitary supplies were stored in movable panniers. Care was taken to insure that all drugs or medicines used were of the highest standard. The supply of such materials was in the hands of British Drug Houses Ltd. and all preparations were subjected to thorough tests—physical, chemical and biological—before issuance. Special attention was paid to the packing and protection of medicines to prevent deterioration before use. Through the work of the research department of British Drug Houses many special products, chemicals and medical accessories of recent discovery and of great value were made available to the working forces engaged in building the pipe line. Seldom if ever has a great construction task of this kind been carried through with so little loss of time from illness and injury.

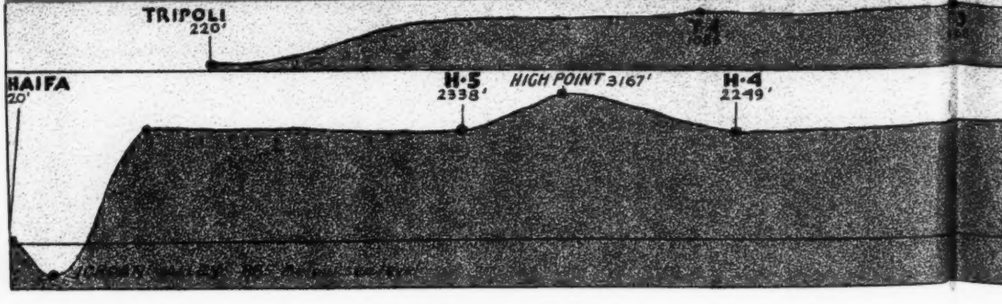
Distance in nautical miles from pipe line terminals to:

Havre	2230
London	2395
Hamburg	2685
Marseilles	740
Genoa	715
Naples	515



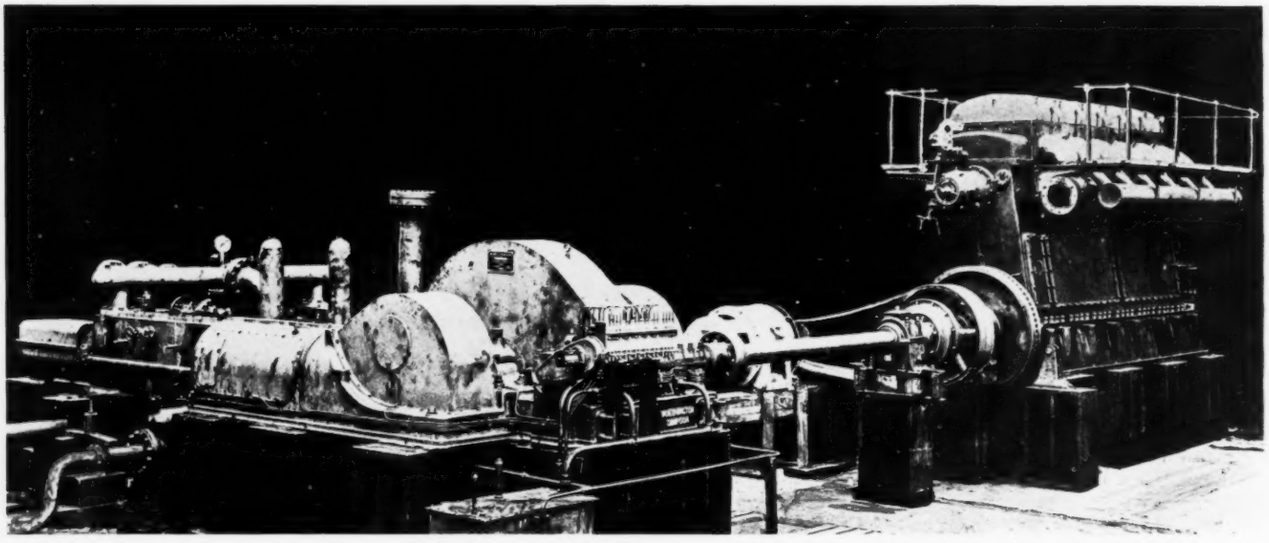
House flag of the Iraq Petroleum Company





Elevation of both branches of the Iraq pipe line in feet

TURKEY
Caspian Sea
MOSUL
K-1 KIRKUK
FATHAH
K-2
BAIJI
ANAH
AL QAIM
T-1
K-3 HADITHA
H-1
IRAN
(PERSIA)
BAGHDAD
TRANSFERRED TERRITORIES
DIZFUL
IRAQ
HILLA
TIGRIS
EUPHRATES
BASRA
ABADAN
KUWAIT
AL KUWAIT
Persian Gulf
BAHREIN I.
K-3 452'
EUPHRATES 300'
T-2
T-1
K-2 478'
TIGRIS 342'
KIRKUK 1006'
200'
H-3 2550'
H-2 1923'
H-1 1312'



Harland and Wolff Diesel engine for Iraq pump station coupled to Worthington Simpson pump for torsiograph measurements on test bed.

Moving 4,400 Ton-Miles of Oil Per Minute

Diesel Engines of 22,500 H.P. with Pumps and Auxiliary Equipment Propel Vast Volume of Iraq Crude across the Desert from Kirkuk to the Mediterranean.

NERVE centers of the pipe line system are the pumping stations which propel the oil on its long journey from the producing field to the marine terminals. In a country where towns and highways are lacking the stations provide the logical locations for stores and for the division headquarters of the service units. In time each station may become the nucleus of a village community.

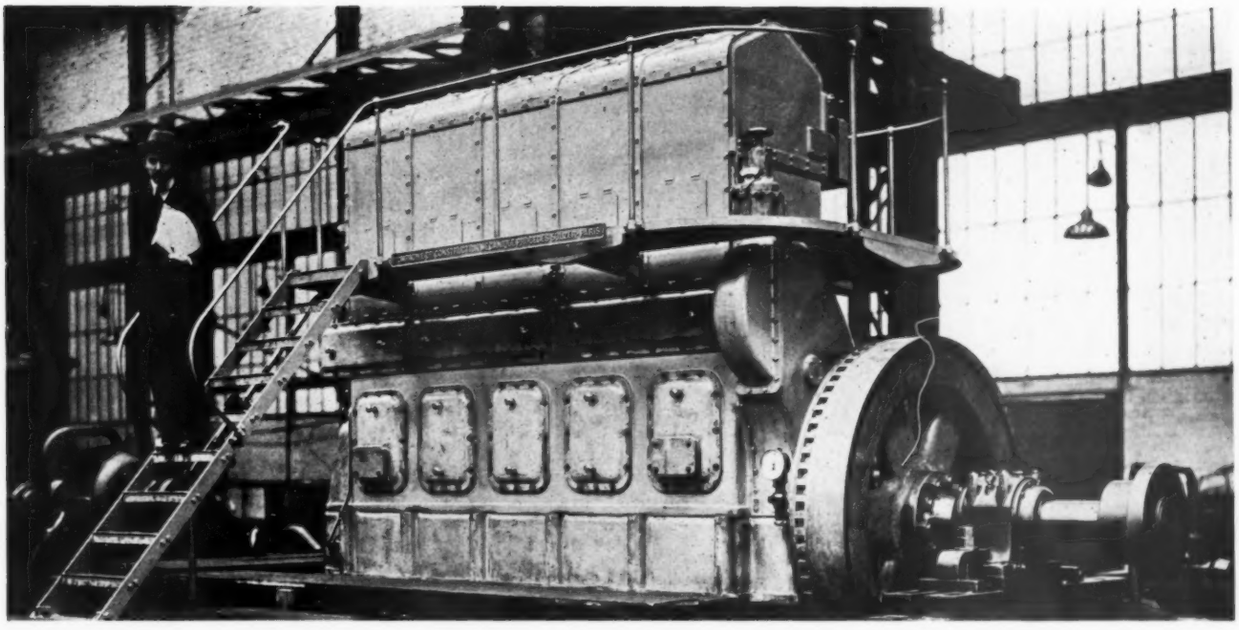
There are twelve of these main stations. Three on the double line between Kirkuk and Haditha are designated as K-1, K-2 and K-3. T-1 to T-4 are on the northern line between Haditha and Tripoli and H-1 to H-5 are on the southern line between Haditha and Haifa. The station sites are from 80 to 160 acres in area. The equipment of each station includes the pump house and its manifold, elevated tanks, stores, workshops and garage, storage tanks, buildings used by the service unit, dwellings of the manager and assistants and living quarters of the native employes. There is an airfield in connection with each station for the use of company planes. The field at H-5 in Trans-Jordan is also a recognized Royal Air Force landing station.

Because of the importance of the pumping stations and their isolated location they are so constructed and arranged as to provide protection against marauding bands. The station grounds are enclosed by a heavy fence of expanded metal and the fenced-in area is floodlighted at night. Entrance to the grounds is through a single main gate and the posts, though in no sense of military construction, are well equipped to withstand ordinary robber attacks. Each station is supplied with means of communication with the outside world not only through the telephone and telegraph line but by wireless as well.

The main function of the stations, of course, is to supply power for moving oil through the pipe line at the speed necessary to permit the designated daily throughput and to act as control points for measuring and checking the quantity of oil passing through. Power is supplied by 45 Diesel engines geared down to horizontal pumps. As fuel these engines use oil taken directly from the pipe line after passing through settling tanks.

The construction of these engines illustrates strikingly the international character of the Iraq enterprise and the contributions to the project made by leading manufacturers of different countries. For the K stations, those along the double pipe line, 500 h.p. 5-cylinder, 4-cycle, solid-injection engines of the Sulzer design were installed. Nine of these were built by the British house of Sulzer Bros. and nine by the Compagnie de Construction Mechanique Procedes Sulzer, Paris. On the southern line 500 h.p., 6-cylinder, 4-cycle solid injection engines, 15 in number were supplied by Harland and Wolff Ltd., Belfast. For the northern line the 12 engines used are 500 h.p. 5-cylinder, 4-cycle solid injection type, built by Werkspoor Co., Amsterdam. The pumps operated in connection with all these engines were built by the British firm of Worthington-Simpson, Ltd., from designs developed by their American associates.

As a matter of engineering interest some details of each of these groups of engines may be given. Those of Sulzer

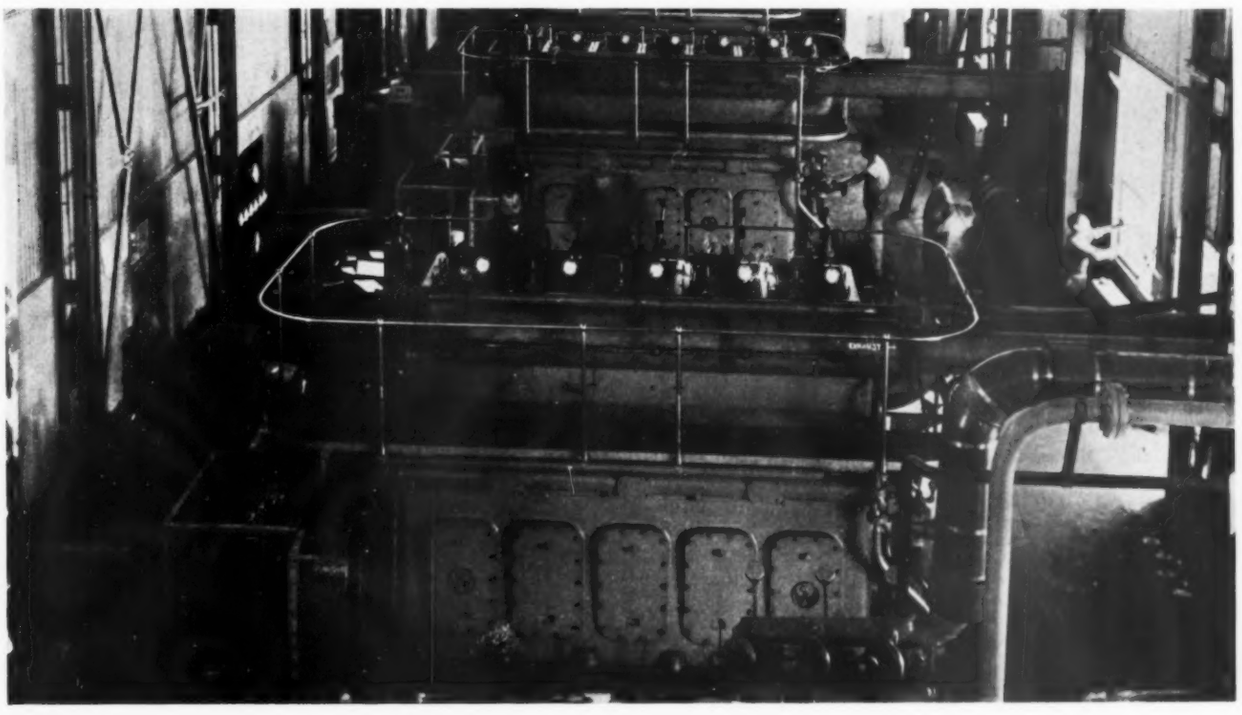


One of the Sulzer Diesel engines built in France for the Iraq pipeline.

manufacture are of 365 mm. bore by 550 mm. stroke and have a rating of 500 b.h.p. at 300 r.p.m. The five cylinders as well as the upper part of the crankcase are cast in one piece of special iron. This provides a rigid box frame which is bolted to the bedplate. In this frame are fitted five interchangeable cylinder liners held rigidly at the top but free to expand longitudinally at the bottom with the usual arrangement of rubber ring joint. Water spaces are so arranged as to intensify circulation near the top of the liner where the greatest amount of heat has to be taken up.

The bedplate is of special cast iron of very rigid design, carrying on cross beams the six main bearings which are lined with white metal. The crankshaft is a single forging of open hearth steel, drilled for forced lubrication of the crank pins and journals. The pistons are of special iron, cast in one piece with bosses

Werkspoor Diesel installed at one of the stations on the line.



to carry the gudgeon pin. Connecting rods are solid steel forgings. Bottom end bearings are of steel lined with white metal, the two halves held together by bolts of special alloy steel. Cylinder heads are of cast iron with mechanically operated inlet and exhaust valves and an automatic fuel valve. Three of the cylinders are fitted with pneumatically-operated starting valves.

The entire valve gear is enclosed by oil and dust proof covers. The camshaft is arranged near the top of the crank chamber and the valves are operated through push rods and rocking levers. The camshaft is driven through spur gearing and in turn drives, through bevel gears, a ball type governor.

A fuel pump mounted beside each cylinder is driven from the camshaft, the quantity of fuel delivered being controlled by the governor to suit the load. In case of possible failure of the main governor an emergency governor cuts off the fuel pumps and prevents the engine from racing. Starting valves on three cylinders are air controlled through pilot valves at the end of the camshaft. All of the engine bearings are force lubricated by means of a rotary pump driven through gears from the crankshaft at the end of the engine furthest from the flywheel. Cylinder liners are lubricated by measuring-type, plunger pump lubricators so that the quantity of oil fed to each point may be accurately regulated.

As already stated the Harland and Wolff engines installed on the southern line have six cylinders instead of five. They are of 330 mm. bore with 580 mm. stroke. As a protection against dust all working parts are fully enclosed and suction air is obtained from a manifold leading outside the building and connected to an air filter of the dry type.

The combined crankcase and cylinder jacket is a monobloc casting, the rigidity of which reinforces that of the bedplate. The crankcase is secured to the bedplate by a large number of bolts having adequate length to overcome the likelihood of breakages such as sometimes occur with studs or short bolts. The main bearing bushes, as well as those of the ends, are of cast steel lined with white metal. Camshaft bearings are separate adjustable units mounted in bored circular seatings. Cylinder liners are of special cast iron recessed into the frame with rubber ring water joints and spigoted metal to metal joints with the cylinder covers at the top. Cylinder covers are of the circular type, with combustion chamber dished inward to relieve temperature stresses. Exhaust valve seats and valve heads are made of special steel to withstand high temperatures. Both exhaust and inlet valves are worked by push rods and levers.

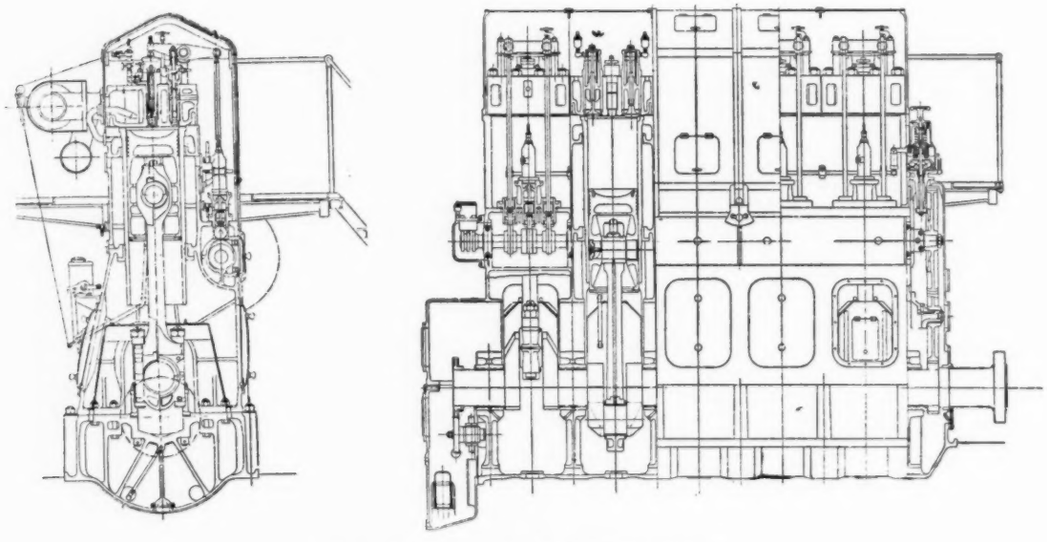
Fuel pumps and fuel valves are of the builders' own design and manufacture. Pumps are of the cam-operated type, in which the amount of fuel delivered is controlled by rotating the fuel pump plunger, and this movement has the effect of advancing or retarding the instant at which holes in the side of the pump are uncovered by spiral grooves in the plunger. Fuel valves are of the normal two diameters spindle type, discharging through a plurality of orifices. The starting valve in the cylinder head is a non-return valve to which air is supplied from the pilot valve worked off the camshaft.

Particular consideration has been given to the accessibility of the main bearings, including that adjacent to the flywheel. Inspection doors in the crankcase proper permit the removal of a piston and connecting rod or these can be removed through the cylinder after the head has been lifted.

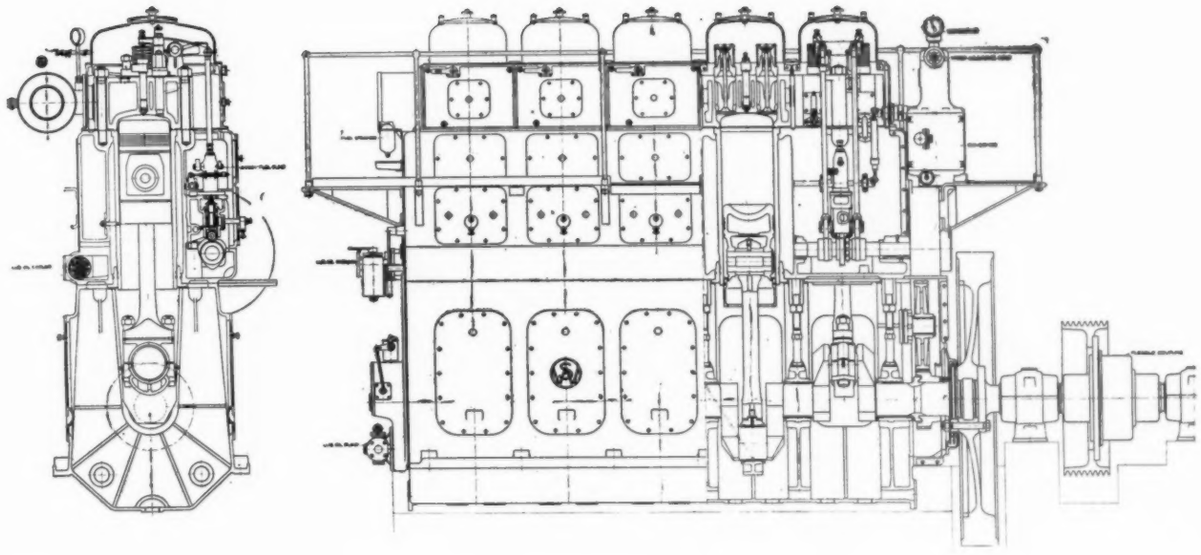
Forced lubrication is used throughout, oil being circulated by means of a cog-wheel type of pump driven off the forward end of the crankshaft. In view of the high temperatures prevailing a lubricating oil cooler of especially large surface is provided. Combustion chambers were designed with particular consideration for the requirements of good combustion and low fuel consumption.

Since the engines can be called upon to operate at rates ranging from 195 to 330 r.p.m. a governor is provided with hand control by means of which the rotational speed may be varied within these limits. Special attention was given to the question of torsional vibration of the crankshaft system, resulting in the crankshaft journals being considerably larger in diameter than would otherwise be required in order to avoid critical speeds above the working range.

Before shipment the engines were subjected to a 72-hr. continuous full load run at the conclusion of which examination showed the cylinders to be in perfect condition. Torsiographic readings taken from an engine coupled to the pump which it was designed to operate con-



General arrangement of Sulzer Diesels for a large pump station between Kirkuk and Haditha.



Cross section and general arrangement of Werkspoor Diesel for the I.P.C. pipe line.

formed with calculated results. In one test the bolts holding the engine bedplate to the stools were gradually removed until the engine was running with only its own weight to keep it in position. Observation of an oil film at the junction between the bedplate and the stools showed that no difference could be detected whether the engine was bolted down or not.

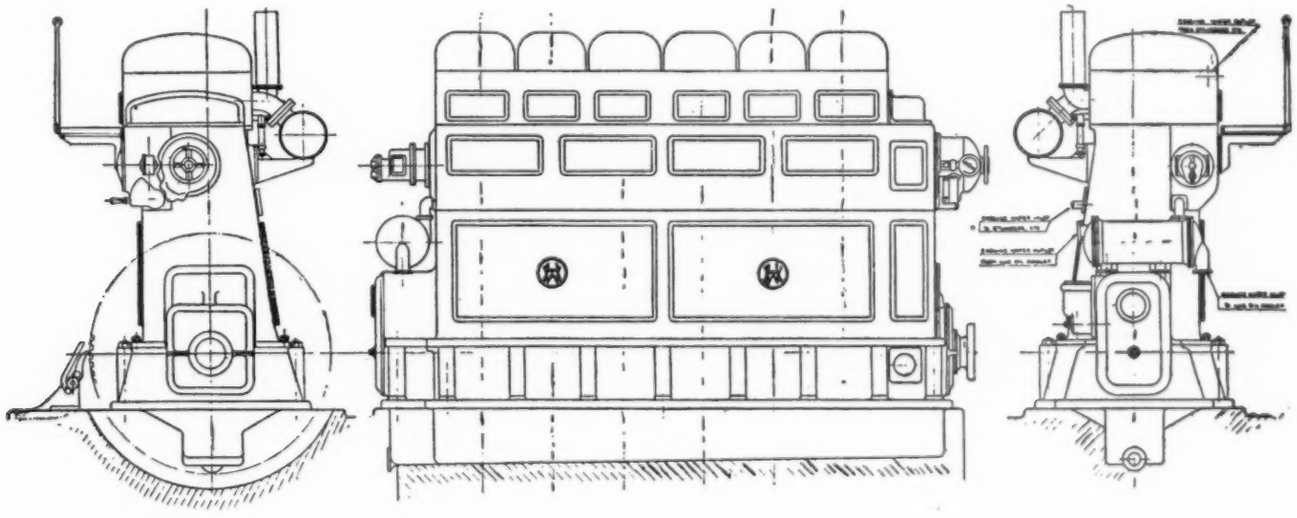
The Werkspoor engines installed in stations on the northern line are of the company's regulation TM type, with five cylinders, 350 mm. bore by 580 mm. stroke, developing 500 h.p. at 300 r.p.m. They are of the trunk piston type without piston cooling and have airless fuel injection by means of Bosch fuel pumps. The engine is provided with a cast iron, U shaped crank casing with doors giving access to moving parts. A box shaped beam containing the cylinder liners and forming a cooling water jacket for the cylinders is mounted on the crank casing by means of studs. The case containing the camshaft and its bearings is cast onto the lower part of the cylinder beam, the camshaft being driven by gear wheels off the crankshaft through one intermediate wheel.

A somewhat unusual valve system developed by the company is employed. There are no special starting cams and rollers, the fuel cam being also the starting cam. The starting air valve carries above it a simple cylinder and plunger. The latter is depressed by the pressure of fuel from the fuel pump at the time of starting, thus opening the starting air valve against the spring and allowing the main supply of starting air to enter the cylinder.

The Bosch pumps are actuated from the camshafts. Fuel supply is under governor and hand control and each pump can be cut out separately. The valves are operated by rocker arms pivoting around a shaft which is mounted to brackets fitted on the cylinder heads.

In order to adjust the clearances of each rocker a hardened bolt is screwed in

General arrangement of Harland and Wolff Diesel for service on the pipe line.



the rocker above the valve stem. Valve springs, rockers and other parts of the cylinder tops can be inspected through an opening in the top cover.

Each engine is equipped with a direct-driven rotary lubricating oil pump and drives a direct current generator by Texrope transmission. The pump shaft is coupled to the engine shaft by a Thomassen flexible coupling governing vibrations over the full range of working speeds between 30 percent below and 10 percent above the normal rate.

The pumps to which these engines are connected are all of Worthington-Simpson design and construction. They are of horizontal duplex, double-acting, outside-packed plunger type, $6\frac{3}{4}$" x 24", with a single reduction of double helical gears placed centrally.

The power end is constructed in three pieces to facilitate transport, the two main side frames being tied together at the front by the pinion shaft bearing bracket and at the rear by heavy cast-iron distance pieces. Crank chambers are embedded in the foundations, securely anchoring the unit in all directions and forming a lubricating oil collecting chamber. All bearings are lined with copper, antimony, hardened tin babbitt and are adjustable.

All raw materials used in construction of the pumps were inspected and tested, castings and forgings being subjected to physical and chemical tests and analyses before machining. All components were machined in jigs and fixtures to insure interchangeability.

The fluid ends were constructed from selected forged steel ingots made to specifications, carefully cropped before forging, split to insure absence of shakes and piping, and then machined all over. Plunger chambers and suction valve boxes were trepanned out and all passages, connecting parts and valve receiving recesses were drilled from the solid.

The valve service is of forged stainless steel, machined to limits, heat treated to a definite standard of quality to withstand abrasive action and impact, and afterward ground to precision limits. Before seating the valves all suction and delivery valve chambers were subjected to pressure tests of 1,200 lbs. per sq. in. with kerosene for a period of 24 hours, a meter being fitted to give a permanent record on a chart.

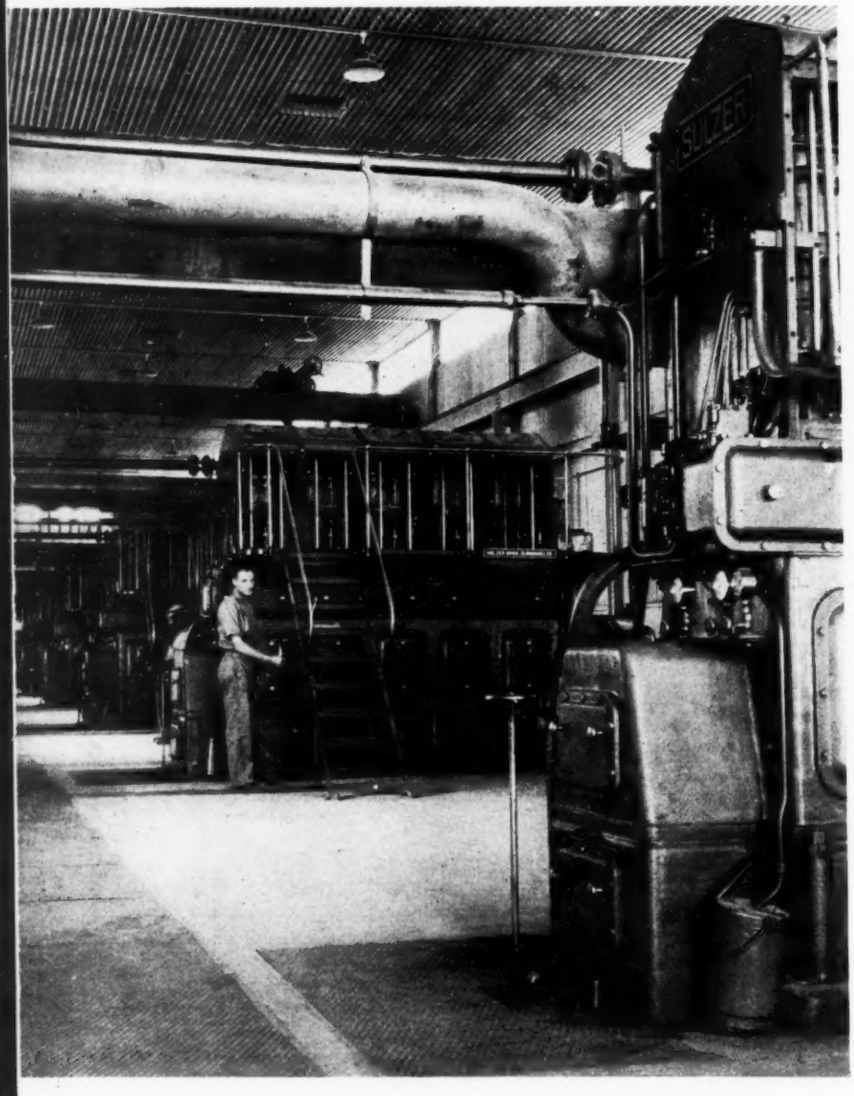
Suction and delivery manifolds are of solid drawn steel tubes, the flanges and forges being electrically welded. Provision is made for by-passing from suction to delivery when starting and relief valves are fitted to operate at a pressure of 900 lbs. per sq. in.

A patent piston type mechanical alleviator is fitted on the discharge side of each unit, of ample capacity to absorb any shocks that may come on the line and smooth out the flow to give quiet operation of the valves.

All moving parts are enclosed in gas-tight chambers, provision being made for ventilation by making use of the reciprocating action of the plungers, a fresh supply of air being drawn in through filters with each stroke. Worthington patent feather valves are used as intake and non-return valves. These are fitted at the back and front ends of both sides and the discharge is led outside the building into the sump.

Consideration has been given in adopting a lubrication system to the high temperatures encountered in the desert and care has been taken to prevent contamination of the lubricating oil. A 16-feed Wakefield visible forced feed lubricator is mounted on the front end of the pump, on the centre line, with adjustable feeds to each point, a check valve being fitted at the extremity. Provision has been made to drain the oil to an enclosed underground tank, where it is filtered and made ready for using again.

Five similar suction pumps are provided, each having a capacity of one and a half pints per minute, on the back of the lubricator. Two of these are coupled to each pinion-shaft bearing and the others provide ample supplies to the lubricator small feeds, which are variable, the overflow being taken back to the underground tank. This tank is provided with grille cooling coils so that oil can be taken from the suction side of the main pump and



Six 500 h.p. Sulzer Diesels in one of the pump stations on the Kirkuk-Haditha double section of the pipeline.

passed through the coils of a Worthington "nuflow" pump of the rotary displacement type during hot weather, the oil being discharged again into the line.

In addition to the main stations a unique feature of the Iraq line is the Jordan Valley relief station. It is situated on the east bank of the Jordan, 850 ft. below sea level and is therefore the lowest oil pumping station in the world. Its location at approximately the low point in the precipitous dip down into the Jordan Valley is due to its single function of relieving pressure on the pipe line whenever it rises about 1000 lbs. per sq. in. Valves set to admit oil to the tanks provided at the station act automatically when this condition exists.

A novel application in the use of heat exchangers is incorporated in the pumping stations. Owing to the scarcity of water it was impracticable to provide a continuous supply of fresh water for cooling the engines. Even the use of cooling towers would cause the evaporation of a considerable percentage of the water every time it was circulated. To avoid this difficulty the jacket water from the engines is cooled in Foster-Wheeler heat exchangers through the medium of oil from the pipe line. While atmospheric temperatures in the desert run to 130° F. or even higher at times, the sub-surface temperature of the oil in the pipe lines underground averages about 75° and it is estimated that under the most extreme conditions it never will exceed 110°. This oil flowing through the heat exchangers at the rate of 590 gals. per minute will cool the jacket water to 125° F. The movement of oil through the exchangers may be regulated to maintain a constant water temperature.

Each heat exchanger contains 1560 sq. ft. of tube surface and there is one for each engine or 45 in all. The oil from the pipe line makes a single pass in the shell and the water from the Diesel engine jackets makes several passes through the tubes in the process of cooling.

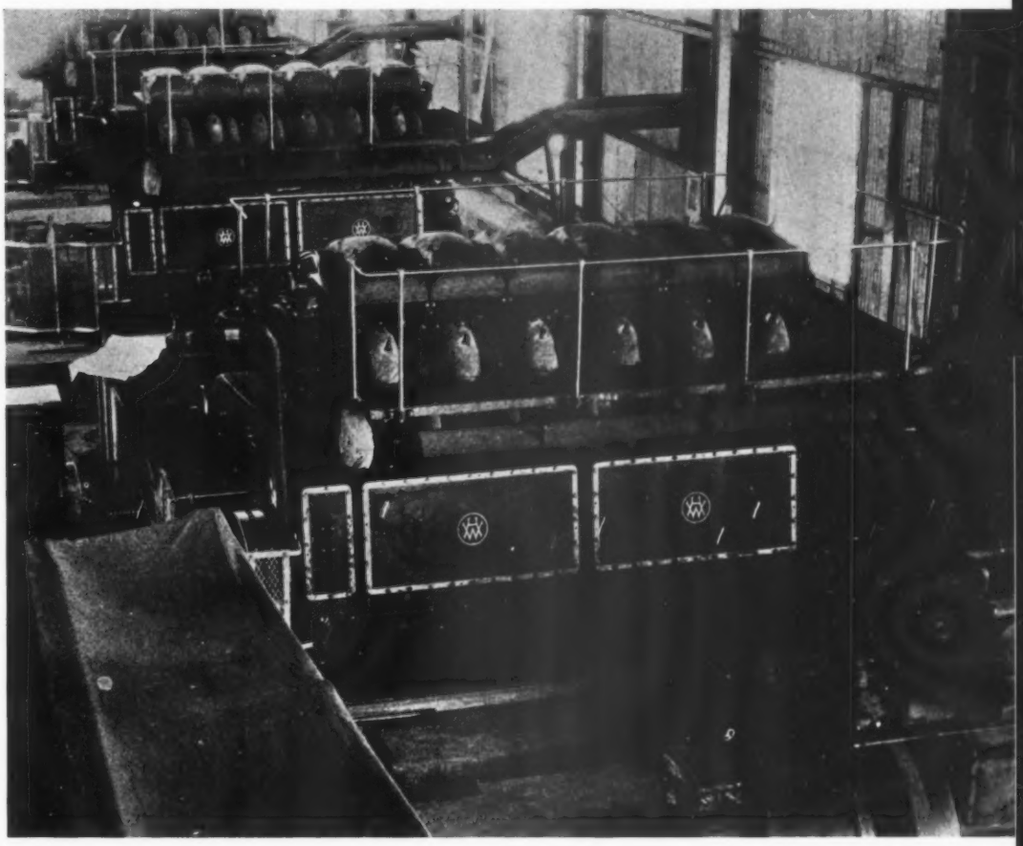
Auxiliary equipment in the pumping stations includes 8" x 10" suction pumps for emptying the main line in case of necessity and 4" x 6" piston type sump pumps for the clearance of drainage oil or leakage. The former are driven by 40 h.p. and the latter by 18 h.p. direct current electric motors. The main drive shaft between main engine and pump drives an auxiliary 45 kw. direct current generator supplying light and power to the station.

Small electric motors and Diesel engines of 20 to 75 h.p. are installed for operating circulating water pumps, lubricating oil purifiers and air compressors. There are three air systems in each station. One is used for starting the auxiliary engines and cleaning the Vokes air filters. A second, with an operating pressure of 570 lbs. per sq. in., is employed to start the main engines. The third, operating under a pressure of 1,000 lbs. per sq. in., is used for charging the alleviators on the main pumps.

Directly outside the pumping station is the manifold pit open on the sides and covered by a galvanized iron roof supported by steel framework. The tankage equipment of each station includes two welded fuel tanks of 6,135 gal. capacity with cone shaped bottoms, mounted on 20-ft. towers, two ground level water tanks and one elevated tank of 10,000 gals. and a 30,000 gal. oil storage tank. At the larger stations on the double line additional water and oil storage is provided.

The buildings in which the engines and other pumping equipment are housed are of steel frame construction covered with corrugated galvanized iron containing approximately 8,400 sq. ft. of floor space at the single line stations and 14,000 sq. ft. at the double line stations. The buildings devoted to stores, garage and workshops are of similar construction. The stores buildings contain complete fire fighting apparatus including centrifugal pumps supplying pressure for hydrant water.

Other buildings within the station grounds include the dwelling of the engineer in charge, a central mess hall with servants' quarters, a block containing housing accommodations for resident bachelors and a similar one for transients and visitors, cottages for the families of married men among the higher personnel and smaller dwellings and quarters for the native laborers. At certain of the stations extra guest houses are provided. All dwellings are constructed with particular attention to alleviating the intense heat of the summer season and are provided with central heating for use during the colder months.



Three Harland and Wolff Diesels installed in a pump station on the Iraq pipe line.

Lincoln Electric Co.

A welding gang on the Iraq pipe line consisting of one welder, two tractor drivers and several helpers who set the skids and dollies for the pipe.

Welding 177,000 Joint of the Iraq Line

Work Progressed in Record Time on World's Longest All-Welded Pipe Line

By J. F. Lincoln

President, The Lincoln Electric Company

THE story of the welding of the Iraq pipe line is one not only of great mechanical ingenuity—it is also a tale of unusual human perseverance in the face of most severe hardship.

Blinding sandstorms, salt marshes, temperatures as high as 150 degrees Fahrenheit, poisonous insects, dangers from marauding tribesmen—all these and many other hazards harassed the welders constantly.

There are many stories of amusing and interesting occurrences in connection with the welding of the Iraq line. Some of these tales have to do with natural hazards, while others bespeak traits peculiar to the native tribesmen.

One American welder, writing from Haifa, discussed the sandstorms as follows:

"Believe me, we have had some tough days over here; we are held up so much on account of strong winds and sandstorms. You have no idea how bad the dust can get in the desert. It is impossible to work with the arc during these blinding storms. You can't even see the pipe which is only a couple of feet away from your eyes!"

Constructed by the most modern method known—arc welding—the Iraq line consists principally of 12 inch pipe in 40 foot lengths, with some 10 inch pipe. Most of the pipe used was 0.33"

Native vessels transporting a boom tractor on the River Jordan.

Lincoln Electric Co.

Lincoln Electric Co.

Neither mountains, intense heat nor deserts delayed the progress of the welding gangs on the Iraq line.

in thickness. The pipe was grade B, A.P.I., containing 0.25 percent carbon; 0.20 percent silicon; 0.70 percent manganese; 0.03 percent sulphur (maximum); and 0.03 percent phosphorous (minimum). The pipe used has a tensile strength of 66,000 lbs. per sq. in.; ductility 26 percent elongation in two inches and yield point 36,000 lbs. per sq. in. A total of 123,000 tons of pipe were required to build the line.

The number of pipes welded together in one section was governed by the topography of the land. On flat or easy rolling ground it was possible to put any number of pipes together, provided the section was not more than 1000 ft. long. With lengths over 1000 ft., it would be necessary to move the welding machine twice on one section, which would waste considerable time. The maximum number of 40-foot pipes that could be handled economically therefore was about 25. The average number of joints per section was 10, although it varied between four and 20.

In welding the pipe, it was lined up on a chill ring by winches or tractors. Each length of pipe was set up on skids, which were made of timber 6″ by 4″ by 3′, and specially constructed rollers, or dollies. The line-up gang consisted of the line-up man in charge, a welder, two tractor drivers, one for the side boom tractor that picked up the pipe and set it on the dollies, the other tractor for hauling the welding machines. The rest of the gang would consist of about 10 helpers for setting the skids and dollies in place.

After lining up, the pipe was held in place by three tack welds. Then two beads were laid, the first with ¼″ electrode and the second with 5/16″ electrode.

An accompanying illustration shows the type of joint used, also dimensions, beveled pipe ends and spacing.

The firing line welding procedure followed closely the practice used in the United States. Since the pipe was raised high enough on dollies to permit welding underneath, very few bell holes were dug.

For the firing line welding, each welder had four helpers consisting of two pipe rollers, one assistant welder and one engine attendant. The pipe rollers were able to roll a 15-joint section with six-foot leverage on the chain tongs. The assistant welder chipped and cleaned each bead as it was finished; the engine attendant hauled the cable, carried electrodes and attended the machine. As each section was completed, the helpers would wind up the cable and stow the equipment which was then hooked up to the tractor and moved to the front of the line. Two towing tractors were used to haul the welding machines. The current used on the firing line was generally maximum in running both beads, the welds in all cases being ⅜″ thick, 30 degrees bevel, tight butt, with chill ring.

In crossing the Jordan, Tigris and Euphrates rivers all pipe was welded on the bank and then dragged across. In laying the pipe in the river beds, it was curved slightly upstream to allow for the effect of current. Every section of the pipe was wrapped in asbestos before it was buried, as a precaution against corrosion.

The welding crews were always well up on the job and, in some cases, the gangs hauling the pipe in were not able to keep up with the welders. Considerable rivalry between the welders and hauling gangs resulted in many races to see who could do the most work.

The record number of welds made by one man during one nine hour day was 72. Some of the crews averaged between 45 and 50 welds per day. A total of 177,000 welds were made during the 12 months required for laying and welding the line.

A total of 54 gas engine driven welding machines were used in welding the Iraq line. The majority of these machines were American made, manufactured by the company with which the writer is connected, rated at 40 volts. The weld-

Lincoln Electric Co.

A Texas welder in Iraq; work on the pipe line being pushed forward despite difficulties resulting from heat and sand.

ing generator of these machines has 60 percent higher capacity than older models rated at 25 volts, and was partly responsible for the high speeds attained in welding this line.

A special time-delay idling device supplied with the American welding outfits insured economical operation of the gasoline engines. This device slows down the engine approximately 30 seconds after the arc is broken and saves up to 35 percent on fuel consumption as compared with other machines not fitted with the device. The 30 seconds delay also has the advantage of permitting the operator to change electrodes without affecting welding current.

"Fleetweld" electrodes manufactured for welding by the shielded arc process, were used. These electrodes provide weld metal with a tensile strength of 60,000 to 85,000 lbs. per sq. in. compared with 66,000 lbs. per sq. in. tensile strength of the pipe itself; ductility, 20 to 30 percent elongation in two inches, and greater resistance to corrosion than mild steel.

The 12 months' time required for completing the 1180 mile Iraq pipe line is remarkable. Three years were actually allowed for the project and nothing less than two years was originally anticipated. Work was started on November 18, 1932, and the last weld was tied in at noon November 20, 1933.

The line was not tested in any way before being put in the ground. After its entire length had been covered, a test was made with oil and only three out of 177,000 welded joints were found to leak. This is truly a remarkable accomplishment.

Practically all the welding was done by American welding operators, using American-made welding machines and electrodes.

The Iraq pipe line was constructed at a cost of $50,000,000 by the Mediterranean Pipe Line Company, Ltd., a subsidiary of Iraq Petroleum Company, Ltd., which holds a concession from the Iraq government to the oil fields in the Kirkuk area.

The Iraq line is 1180 miles in length and will transport 30,000,000 barrels of oil a year from Iraq to the ports of Haifa in Palestine and Tripoli in Syria. The huge conduit threads its way over mountains, past ancient ruins, across desert and lava beds and through sun-baked valleys 800 feet below sea level. About 12,000 men were employed on the project.

A native tribesman looks on while an American operator welds one of the 177,000 joints on the longest all-welded pipe line in the world.

Lincoln Electric Co.

Some of the Men Who Participated in the Construction of the Iraq Pipe Line

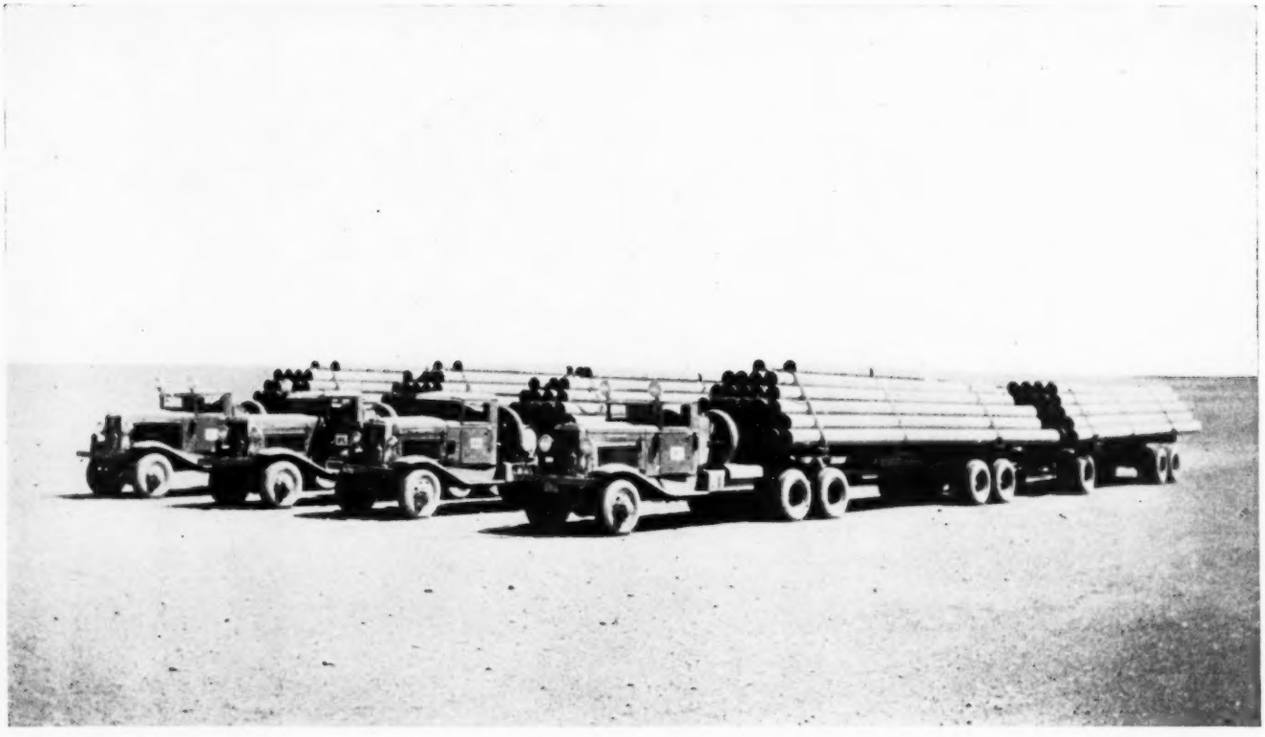
Top right: H. S. Austin, head of the pipe line department.

Top left: M. M. Stuckey, general superintendent.

Middle left: C. A. Mulligan, pipe line superintendent.

Lower left: G. W. Dunkley, O.B.E., general manager in the Near East.

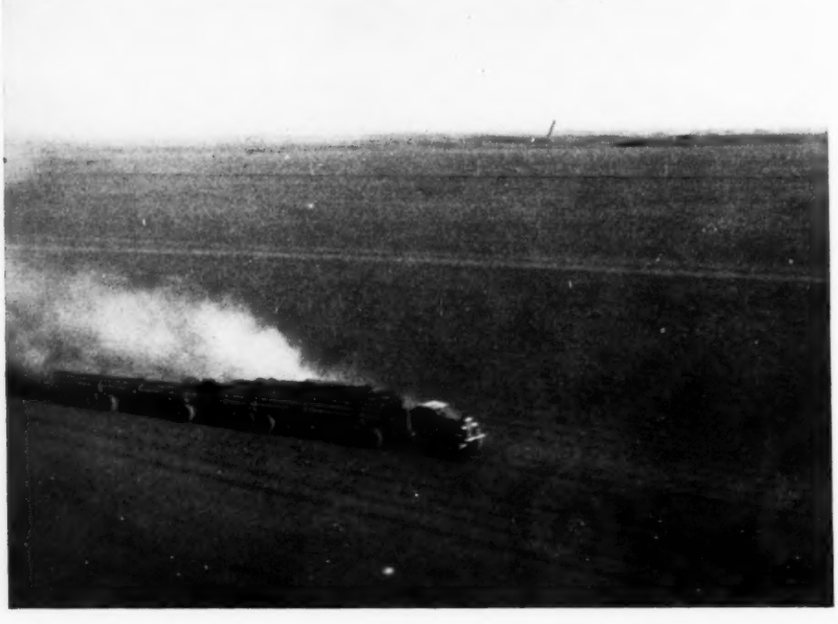
Lower right: B. J. Davis, welding superintendent.



Modern Transport Made Iraq Line Possible

Above: Four Marmon-Herrington trucks carry 1.87 miles of pipe line—sixty-four 12 in. pipes 40 ft. long.

Below: Marmon-Herrington truck and trailer in action on the Iraq desert as seen from a plane.



By A. W. Herrington

COMPLETION of the Iraq pipe line brings to an end a modern saga of transportation. The construction of this line was largely a transport problem.

Thousands of tons of miscellaneous material and supplies of all kinds, including water, had to be transported out into a trackless inferno of a desert.

Fifteen years ago it would not have been possible to build this line within the limits of any capital investment which would have made it a sound business venture.

The possibility of its final construction was due in great measure to the development of a durable pneumatic tire for motor trucks. There are few of us who would stop to consider the extent to which the development departments of Dunlop, Goodyear, and Firestone have contributed towards the successful accomplishment of this line.

The great distances to be covered with each load, to which were added the diffi-

Pulling a heavy load up the steep grade from the river side dump at Hoditha.

culties and expense of maintaining personnel in the desert, brought up some unusual transport problems.

Through the courage and foresight of the officials of the Iraq Petroleum Company there was presented an opportunity to conduct a transport experiment which was unusually successful.

The absence of normal transport restrictions to size and weight, plus the desirability of moving the largest possible load as fast as possible out into the desert, was apparent at first analysis.

The first large unit was a six wheel drive tractor with semi-trailer and six wheel trailer. This outfit was 110 feet long and had thirty-two tires each 20 x 11.25 upon which its fifty-ton load of pipe was carried.

Three additional duplicate outfits were ordered.

These four vehicles completed 2,000,000 ton miles, or one sixth of the entire movement of 12,000,000 ton miles of pipe line material.

Each month that each of the above units was in service it averaged 71,400 ton miles per month, or more than four times the average of any other vehicle in the fleet.

One of these vehicles in one month accomplished a record of 119,478 ton miles for the period.

The cost per ton mile for the operation of these units was correspondingly lower than that of any other vehicle in the fleet.

These results were due to the spirit of genuine cooperation and efficiency exhibited by the transport personnel of the Iraq Petroleum Company.

In spite of the excessively trying conditions under which operations had to be maintained, there was always a continuous drive to get every ton mile possible out of the equipment. This effort was not coupled with abusive operation. The vehicles were handled by native drivers, and were backed by a service of lubrication, inspection and maintenance which resulted in a transport record which is a credit to the company and its management.

The whole feat has opened a new era of construction possibilities in the world.

Regardless of terrain or climatic conditions, modern motor transport is capable of solving even the most difficult problems.

The efficiency and rapidity with which the Iraq Pipe Line was constructed augurs well for its continued successful operation.

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Correction

IN THE October issue of WORLD PETROLEUM it was erroneously stated that the reaction chamber for Creditul Minier's new refinery in Roumania was constructed by A. O. Smith. The reaction chamber was actually made by Fried Krupp, A.G. of Essen, Germany, and installed in connection with the Dubbs unit in the Roumanian refinery.

Equipment Used in Construction of Iraq Line

Welding Machines

ELECTRIC generators used in providing power for welding the Iraq pipe line were supplied by Lincoln Electric Company, Cleveland, Ohio, and by Wilson Welders and Metals Co., New York, in conjunction with G. D. Peters & Co., Ltd., London. Fourteen of these generators were employed and they moved rapidly along the line where the pipe had been lined up, their expert operators completing the welds with such speed that they were always well in advance of the filling and covering gangs. The method of welding is described in detail in a special article in another part of this issue.

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Foster-Wheeler Heat Exchangers

OIL from the Iraq pipe line itself is cleverly used to cool the jacket water of Diesel engines in the pumping stations along the line. This is accomplished in the 45 heat exchangers supplied by Foster-Wheeler Corporation, New York. The reason for this novel adaptation is of course the scarcity of water in the desert which makes its conservation a matter of great importance while oil is right at hand in the pipe line in virtually unlimited supply. While surface temperatures along the pipe line are extremely high at certain seasons of the year the oil, passing underground, has an average temperature of about 75°.

Each exchanger contains 1,560 sq. ft. of tube surface. Water from the engine jackets makes several passes through the tubes while being cooled by the oil passing once through the shell. The flow of oil may be regulated to maintain a constant water temperature. This equipment is fully described in the article dealing with the pumping stations and their equipment which appears on other pages.

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National Tank Co. Gas Separators

THE gas separators through which Iraq oil is passed at Kirkuk prior to its entry into the pipe line were supplied by National Tank Co., Tulsa, Oklahoma. They are 7′ x 24′ with a rated daily capacity of 100,000 bbl. oil and 150,000,000 cu. ft. gas at 125 lbs. working pressure. As the oil enters the separator it is spread to the side wall of the shell in a fan-like stream by a diverter. The heavier particles of oil take a downward and outward course while the lighter particles of gas follow an upward and inward helix. The gas follows a vertical and circumferential course to the upper part of the separator, being scrubbed on the way. It is then directed through baffles where a further separation of oil takes place. The arrangement is such that oil once separated never again comes in contact with the gas.

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Crane Valves

MORE than 265 tons of valves besides more than 1,100 tons of fabricated piping and flanges as well as other equipment were supplied to the Iraq Petroleum Company by the Crane Company from its works in Chicago, U. S. A. High pressure headers with welded nozzles, valves and piping for station manifolds were obtained from this company whose facilities for turning out its special products in large quantities are widely known.

The welded manifolds for suction and discharge lines, as well as miscellaneous piping supplied by the Crane Company were subjected to a kerosene test of 2,000 lbs. as required in specifications and have given perfect service under the high pressures maintained by the pumps on the pipe line.

Large quantities of cast iron flanged fittings, malleable iron fittings, radiator valves, brass globe valves and radiators for heating pumping stations and houses were supplied to the Iraq Petroleum Company by Crane, Ltd., London.

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Buckeye Traction Ditchers

THE route of the Iraq pipe line afforded a severe test of trenching machinery. It was essential that the equipment not only have the strength and power to penetrate the rough and stony structure of the hill regions and the lava country but also the speed to dig rapidly through the soft alluvial deposits existing along certain portions of the line.

The machines selected for the task were eight Model 32 standard trench excavators built by the Buckeye Traction Ditcher Co., Findlay, Ohio, a type of equipment that has been used successfully on other big pipe line projects in the world's important oil fields. The digging wheels on these ditches were built to excavate a trench 24″ wide and 6′ 6″ deep. A four-speed transmission enabled quick shifts in speed to be made and to adapt the machines to varying soil conditions special transmission drives gave a total of 24 possible speeds varying from two inches to 19 feet per minute. At the slower speeds the machines cut their way through practically every kind of soil formation except solid rock.

The main frames of the ditchers were built up of 9 in., 21.8 lb. I-beams with channel and cast steel cross members. All joints were made with double angle connections, hot riveted. Drive chains were of high grade steel, roller type and all sprockets of cast steel, heat treated where wear was to be encountered. Bearings were of roller type or high quality babbit, depending upon their use.

Low ground pressure was provided by extra width of front wheels and large area of the crawler treads. The "Alligator" crawler wheels were oscillating, thus reducing wear and aiding in negotiating heavy grades over rough terrain. Lever control of a power steering device made accurate operation easy. The machines completed their two-year service without the necessity of out of the ordinary repairs or replacements, strong testimony to their strength and the correctness of their design.

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Line Wrapped with Johns Manville Felts

FOR the protection of the pipe used in the Iraq line it was coated with an enamel developed by Standard Oil Company (New Jersey) and then wrapped with asbestos asphalt-saturated pipe line felts manufactured by Johns-Manville Corporation, New York. Involving as it did the covering of approximately 1,200 miles of pipe this was the largest single pipe wrapping job ever undertaken. It required the use of 200,000 squares of felt, totaling in area about 500 acres. Sixteen pipe wrapping machines were used to wind the felt spirally on the pipes. Each roll of felt was 12″ wide and 150′ long, treated and packed to withstand a sun temperature of 180° and to insure delivery in the same condition in which it left the factory. Shipments were made to Basra, Haifa, Tripoli and Baiji and it is interesting to note that the entire transaction was completed without a complaint or error.

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Portable Air Compressors Speeded Rock Excavation

MUCH of the route of the Iraq pipe line extends across districts in which solid rock or heavy boulders at or near the surface made drilling and blasting necessary in constructing the trench in which the line is carried. Across the lava country in Trans Jordan, a stretch of 100 miles, rock excavation was required most of the way. Much basalt rock was encountered between Tripoli and Homs on the northern line and on the west bank of the Jordan on the southern route. Between Haditha and Wadi Tharthar in Iraq, a gypsum bed nearly 40 miles across was met.

Power for drilling was provided by 60 Type-20 portable air compressors, 5½″ x 5″, supplied by Ingersoll-Rand Company, Phillipsburg, N. J. With the compressors in their assignment to positions along the line went a complement of R-39 "Jackhammers" and CC-45 paving breakers. In the lava country alone 20 of these compressor outfits were operated in double shifts of 16 hours between January and September, 1933. In this section some 500,000 holes were drilled and blasted. The holes ranged in depth from 18 inches to five feet and averaged around three feet. Because of the boulder formation a second and even a third drilling and blasting were many times required in the same location.

Owing to the heavy service imposed by the long hours, the intense heat and the prevalence of dust it was expected that many of the compressors would be unfit for further service after their experience in the lava country, but every one of them finished the job in serviceable condition. The drills and paving breakers gave equally good performance and there was not a case on record of a broken piston.

A modern blacksmith shop was provided to maintain the equipment of each ditching gang. This was housed in a corrugated iron structure 20 x 15 feet in ground dimensions and 10 feet high so made that it could be easily dismantled and reerected with each change in camp site. Extra air-receiver capacity was provided by welding the ends of a 40-ft. section of 12-in. pipe and fitting it with 2-in. inlet and outlet pipes and one-half inch drain valve. By running a 2-inch flexible connection from the aftercooler of the portable compressor which served the shop to this auxiliary receiver vibration was entirely eliminated from the air lines. The added receiver capacity served to maintain adequate pressure for the working of the shop equipment. Each shop contained a No. 40 drill-steel sharpener, a No. 26 oil furnace, a No. 8 pedestal grinder, an E-44 power hammer, a Type "C" pneumatic or post drill and two or three hand forges.

In the building of the telegraph and telephone lines the air compres-

sors were brought into play in excavating post holes in rocky sections. An I-R portable compressor mounted on a light truck was used in supplying fast service for this purpose along the southern line. Portable drilling sets, mounted on 5-ton trucks, were used in drilling water wells. Riveted storage tanks at the pumping stations were fabricated with the use of 6A riveting hammers and Size "C" pneumatic drills supplied with air by a Type-20 compressor. Stone used in constructing buildings at the stations was quarried locally with R-39 "Jackhammers" operated by Type-20 compressors and was dressed by pneumatic scalers and picks.

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Tyres and Tires

NOWHERE have modern pneumatic tires encountered more grueling conditions than those met with in the construction of the Iraq pipe line. Not only was it necessary to carry extremely heavy loads over long distances but the work had to be done in a country without a semblance of roads and where every conceivable kind of hard going was met with—sand, mud, rocks and thickly-strewn boulders, many of which stood axle high. Temperatures varied 100 degrees or more and blinding storms that drove sand into every bit of exposed machinery were of frequent occurrence.

The challenge of these conditions was successfully met by leading British and American manufacturers and the standard makes of Dunlop, Goodyear and Firestone, including some of the largest tires ever built, showed astonishing life and wearability under conditions that seemed especially designed for the destruction of all rubber fabrics. Four of the largest truck-tractor and trailer units ever constructed, each carrying a total load of 60 tons, employed in the transport division of the pipe line, were equipped with tires made by the Firestone Tire and Rubber Company, Akron, Ohio and Brentford, England. Each unit was mounted on 30 tires. The heavy lorries used in the lava country were equipped with low pressure pneumatic tires, 13.50 x 20, made by the Goodyear Tyre and Rubber Company (Gt. Britain) Ltd., Wolverhampton, England. Other British trucks were equipped with similar tires of standard pattern built by Dunlop Rubber Co. Ltd., London.

In order to assure proper attention to maintenance and repair work in the field the Iraq Petroleum Company, before embarking on its construction work, sent engineers to the Firestone factory at Brentford, England, for a careful study of the subject, an act of foresightedness that undoubtedly contributed much to the fine record of tire performance made in the building of the pipe line.

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Marmon-Herrington Pipe Hauling Units

SOMETHING new and hitherto unattempted in heavy transport facilities was developed for the Iraq Petroleum Company by Marmon-Harrington Company, Indianapolis, Ind. in the form of specially designed, all-wheel-drive, pipe hauling units. Four of these units were used in the work of pipe line construction, each consisting of a truck-tractor, semi-trailer and trailer and each capable of hauling 60 tons of pipe in a single load. Each full load of pipe represented the equivalent of 1.84 miles of line. Together the four units performed 2,000,000 ton-miles of haulage in the course of the work.

The truck-tractors employed in these units were of the company's regular Model TH-320-6 type, six-wheel drive, with all wheels driving. They were powered with 6-cylinder engines, 500-foot-pounds torque, fitted with Westinghouse air brakes and with front axle and steering mechanism of exclusive Marmon-Herrington design. Each unit had an overall length of 100 ft. and was mounted on 30 tires, but was able to turn in a 90-foot circle. Each unit had standard and auxiliary transmissions with twelve speeds forward and three reverse and weighed approximately 20 tons.

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White Heavy Duty Trucks

ALL oilfield operations are regarded as a rigorous test of truck performance and stamina, but few others can be compared to the Iraq project in which extremely high temperatures, rough terrain, sand-laden atmosphere, absence of roads and other handicaps had to be surmounted. White heavy duty trucks built by the White Company, Cleveland, Ohio, have played an important part in the construction of this desert pipe line from the beginning. Ten Model 643 White six-wheelers went into service when the work started in the spring of 1932. Since then the fleet has more than doubled and now numbers 22 of this same model.

These trucks were called upon to haul tremendous tonnages of pipe and miscellaneous equipment but they were essentially the same as thousands of other heavy duty Whites in oil service all over the world, powered by the same six-cylinder White engine that has proved itself in millions of miles of heavy duty service. The truck frames were heat treated in accordance with White's standard practice. Exposed working parts were protected against the abrasive action of the sand by leather boots.

Some of the Whites in the Iraq Company's service were equipped with four-wheel pole trailers adjustable to varying lengths of pipe. Others had a drop-frame type of semi-trailer with steel bodies for transporting machinery, tractors and heavy equipment. Special attention was devoted by the White Company's engineers to meeting the wide range of temperatures, sometimes rising to 130° F, encountered in Iraq. The success with which this problem was met is indicated by the repeat orders received.

The newest contribution of the White Company to oilfield transport are "underslung power" trucks, powered by 12-cylinder horizontally-opposed engines of White design. In these new trucks announced only three months ago, payload space is increased to its maximum in relation to wheelbase, a feature which recommends them particularly to the oil industry.

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International Harvester Equipment

A FLEET of some 100 International motor trucks and eighty McCormick-Deering tractors mounted on tracks, supplied by International Harvester Export Corporation, Chicago, U. S. A., played a very prominent rôle in the difficult construction of the Iraq pipe line. Most of the motor trucks were of 1½-ton and 2-ton size, although some of the heavy-duty units were also utilized. A number of the trucks were equipped with winches.

When equipment and supplies began to arrive for this big pipe line job these McCormick-Deering tractors and International motor trucks were assigned a major part of the transportation and construction work.

The project was carried on across country where there were no highways, railroads, or other means of transportation except these tractors and trucks blazing their own trails. Not only did they do the mechanical work connected with laying the pipe lines, but they were also called upon to transport from the seaboard, pipe, supplies, machinery for the pump station, men, and food supplies to points along the way.

Many of the McCormick-Deering tractors were used in the actual job of laying the pipe, while others operated compressors and welders; still others, equipped with back-fillers, filled the trench after the pipe had been laid. Five 40-foot lengths of pipe were welded on the ground, tied on to the main line, and then lowered into the trench. The McCormick-Deering tractors not only did the heavy work of placing the pipe, but also did the preparatory work.

A number of the McCormick-Deering tractors were equipped with post hole diggers. They were used to build the overhead telephone cable paralleling the pipe line. These units were also mounted on crawler tracks. The hole digging machines drilled a telephone pole hole in 3 or 4 minutes. With a pole-handling boom this same unit raised and placed the poles. An interesting feature of the cable line was placing the poles on angle—to withstand the continuous high winds so common to portions of the country the pipe line passed through.

Although the pipe line territory was mostly desert, there were times during the heavy periodic rains when portions were transformed into quagmires. At other times sandstorms so dense that objects three feet away were invisible raged for days. Despite all this, the McCormick-Deering tractors and International trucks met no combination of conditions that halted them. They carried on through rocks, mud, and sand, leading the way to completing the entire project months ahead of schedule.

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Trackson Treads

TRACKSON COMPANY, Milwaukee, Wisconsin, whose heavy-duty industrial crawler-tractors have assisted in laying thousands of miles of pipe lines in all parts of the world, were called upon to furnish a great fleet of their Model G Trackson-McCormick-Deering crawler-tractors for the Iraq pipe line. These tractors were equipped with earth boring machines, pipe booms, backfillers and winches, and were chosen for this gruelling service because of their reputation and ability to get a job done.

The actual pipe line construction work, from lining up to backfilling the ditch, was handled by Model G Tracksons with their auxiliary equipment. These same types of crawler-tractors were also used for pulling welders, compressors and transporting materials for the construction gangs. A total of 81 Trackson tractors, with their operating equipment, and vast quantities of supplies, was furnished by the Trackson Company for this project, and the fact that the line was completed months ahead of schedule is an indication of the dependability of Trackson products.

Post holes for the telegraph line also were dug with Tracksons equipped with Buda earth boring machines.

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Four-Wheel Drive Truck

ON THE wall of the directors' room of the Four Wheel Drive Auto Company, Clintonville, Wisconsin, hangs a photograph of a page from the Bible, opened to the 23rd verse of the 19th chapter of Isaiah: "In that day shall there be a highway out of Egypt to Assyria, and the Assyrian shall come into Egypt and the Egyptian into Assyria, and the Egyptian shall serve with the Assyrians."

Now this prophecy has been fulfilled and a Four Wheel Drive truck has helped make the fulfillment a fact. The principle of four-wheel propulsion extended to six wheels through three double reduction axles proved of the greatest value in the desert. The truck went back and forth over the 1,300-mile trip from Haifa to

Baghdad and return, week in and week out, often with loads up to 25 tons. It was always on time, never had to ask for help and negotiated many tough spots that it could not have traversed with rear wheel propulsion only. At a conservative estimate it has to its credit over 3,000,000 ton-miles and it is still going strong.

A valuable feature of this truck was the Westinghouse air-type service brake acting directly on the drums of all six wheels.

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Buda Post Hole Diggers

IN BUILDING its telephone and telegraph line across the desert the Iraq Petroleum Company made use of mechanical post hole diggers manufactured by the Buda Company, Harvey, Illinois. These drills were able to drill holes 9 ft. deep with cutters adapted to holes of 12-in., 18-in. and 26-in. diameter. In addition to these blast hole drills were furnished for drilling rocks. The earth drills were mounted on McCormick-Deering industrial tractors equipped with Trackson crawler treads. The drills were mounted in front of the tractors and were driven from the standard side-power takeoff by means of chains. They were able to drill holes up to 45 deg. angle sideways and 15 deg. fore and aft and their use enabled the pole line to be built in much less than the estimated time. The machines can be provided with additional attachments permitting holes to be drilled up to 50 ft. for exploration work.

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Traveling Pipe Line Cleaners

PREPARATORY to painting and wrapping the pipe it was necessary to clean it thoroughly by removing all scale, rust and dirt. This was done after the pipe had been welded in sections but before it was placed in the trench by means of a traveling cleaning machine made by the W-K-M Co., Houston, Texas. This machine consists of a carriage and motor-driven assembly which travels along on top of the pipe line under its own power. Its revolving head assembly contains toothed, hardened-steel cutter wheels which exert a constant chipping action on the pipe as they revolve around it. These cutters are followed by steel wire brushes which remove all loose material from the pipe. The machines are equipped with an attachment by which a priming coat is applied to the pipe immediately after the cleaning process, thus avoiding the possibility of any rust or dirt accumulating between the priming and cleaning operations.

For handling the pipe during the cleaning operation and also for placing it on skids, lowering it into the trench and backfilling W-K-M side booms mounted on tractors with crawler treads were employed. This equipment proved itself a great labor saver in the heavier tasks of moving and handling pipe.

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Hose for Tanker Loading

FOR the loading of tankers at the marine terminals of the Iraq pipe line special hose manufactured by the Boston Woven Hose and Rubber Co., Boston, Mass., is used. A feature of this equipment is a new patented type of nipple made of seamless steel pipe which can be expanded after the hose is vulcanized. The length of the nipple is about two feet. In its central portion are two annular rings of seamless steel, six inches apart, which are welded to the body of the nipple and are overlaid with three plies of rubber. After the hose is vulcanized the six-inch section of the nipple between the rings is expanded and the tendency to loss of pressure previously encountered with the clampless nipple is overcome.

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International Pipe Supply

FIVE nations participated in supplying pipe for the Iraq line. The 12-inch main line pipe was fabricated by French and German companies. The 10-inch main line pipe was made by American, British and German groups and the 8-inch pipe was provided by a British firm. The French companies participating in this work were Louvroil et Recquignies, S. A., d'Escaut et Meuse and Acieres et Usines à Tubes de la Sarre. The British suppliers of pipe were Stewarts & Lloyds Ltd. in connection with British Mannesmann Tube Company and Bromford Tube Co. American companies represented in this work were National Tube Co., Spang Chalfant & Co. and Youngstown Sheet & Tube Co. Other houses participating in the pipe contracts through Oil Well Engineering Co. Ltd. were Vereinigte Stahlwerke A.G. and Mannesmannrohren Werke, Germany and Bismarckhutte, Hajduki Wielkie, Poland.

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Diesel Engines

FORTY-FIVE Diesel engines developing 22,500 horse power are installed in the pumping stations along the Iraq pipe line. They were built by the well-known manufacturers, Harland & Wolff, Belfast, Sulzer Bros., London and Paris, and Werkspoor Co., Amsterdam. This equipment is described in detail in another part of this issue. The selection of Diesel engines for this service is a noteworthy tribute to their adaptability to difficult conditions.

Vallourec Seamless Pipe

OF THE 12" pipe used in construction of the Iraq pipe line some 26,000 tons or about one-quarter of the entire line came from the works of the Société Vallourec, Paris. This great quantity of seamless tube was fabricated in the large plant of the company at Aulnoye in the north of France and was delivered within the period of a year. It represents one of the most important of French contributions to the creation of the pipe line.

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National Oil Engines

FOR the operation of auxiliary electric and pumping machinery in the stations the Iraq Petroleum Company Ltd. has installed 53 heavy oil engines built by The National Gas and Oil Engine Company, Ltd., Ashton-under-Lyne, England. These engines are of the RV 3 three-cylinder type with an output of 75 BHP at 500 r.p.m. after allowing for altitude and temperature conditions. They are direct coupled to electrical generators of British Thomson-Houston make and include special features such as lubricating oil coolers, duplex strainers for both fuel and lubricating oils, Vokes air filters and thermometers fitted to the exhaust outlet on each cylinder.

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Crompton-Parkinson Generating Sets

FOR welding, lighting and power service on the Iraq pipe line more than 50 generating sets for petrol and oil engine drive were supplied by Messrs. Crompton-Parkinson Ltd., London. These included over 20 arc welding sets supplied to G. D. Peters Ltd. They were of the single welder type, 1450 r.p.m., 300–400 amps, with the appropriate drooping voltage characteristic required for welding. The machines were designed especially for service under hot and sandy conditions and were fitted with air filters on the intake side.

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Worthington-Simpson Pumps

IN THE operation of the Iraq pipe line an essential feature is the battery of pumps which move the oil on its long journey from the fields to the Mediterranean. These were designed and built by Messrs. Worthington-Simpson Ltd., Newark-on-Trent, England. The 45 main units located in the 12 pumping stations along the line operate under a pressure of 800 lbs. per sq. in. and are capable of delivering at the marine terminals over 3,000,000 Imperial gallons of crude per day with one-third of the units as standbys, allowing frequent shutdowns for cleaning and adjustment.

These units are horizontal duplex double-acting outside packed plunger pumps, 6¾" diameter by 24" stroke having single reduction of helical gears placed centrally. The overall dimensions are 25' x 10' 3" x 5', weighing just over 25 tons each. This entire order was turned out in the record time of 270 days to date of first shipment.

Auxiliary pumping equipment included a number of portable groups of the horizontal duplex double-acting piston pattern type with double reduction machine cut gears mounted on standard gauge mobile trucks. These pumps, totally enclosed and driven by high-speed paraffin engines, were capable of giving a discharge pressure head of 460 ft. and were used for service duty during the construction of the pipe line. Each unit was complete with fuel tank, special radiator, large cooling fan and a sheet metal canopy with side sheets for protection in sand storms or in cold weather.

Each station on the line has installed three horizontal split casing ball bearing centrifugal main circulating pumps, one unit being direct motor driven and the others direct-coupled to Diesel engines. On the double line from Kirkuk to Haditha these units are Worthington-Simpson 4-L-1 and 4"/6" R, giving 450 gals. per minute at 69 ft. head. In the stations along the single lines they are of the 3-L-1 single-stage type and 3" 4" U two-stage type having a capacity of 250 gals. at 69 ft. head. These units are used for circulating water through the engine jackets and returning through heat exchangers, oil from the main supply being used for removing the heat so that the water can be used over and over again.

Two four-stage horizontal split casing centrifugal pumps 3"/3½" are installed in each station for fire and water service. They are designed for 125 gals. per minute and operate at a pressure of 150 lbs. per sq. in. when running at 1400 r.p.m. Two other pumps of the 1½" S.B. centrifugal type are provided in each station for bungalow heating supply and general purposes. Each station is fitted also with a Worthington-Simpson patent "Nuflo" rotary displacement pump (monobloc type) for lubricating oil transfer from tanks.

Two special pumps for salvage of crude oil and water are part of the pump room equipment. These are totally enclosed duplex piston pattern power pumps, fitted with "Ni-resist" removable liners, stainless steel valve service and rods, driven through double reduction gearing and flexible couplings. They are designed for operation at temperatures of 20 F. to 130 F. and at altitudes up to 2500 ft. and are intended for draining pipes or tanks in case of necessity.

Altogether a total of 228 units of varying sizes and types have been supplied by Messrs. Worthington-Simpson Ltd. to the Iraq Petroleum Company Ltd. for use in connection with the pipe line.

In other fields Worthington has contributed to pipe line pumping equipment. Through the Société Worthington-Batignolles two centrifugal motor driven pumps were supplied to the Compagnie Francaise de Raffinage, while the pumps for the Albania pipe line were manufactured in Italy by the Societa Italiana Pompe e Compressori (Worthington's Italian company).

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Babcock & Wilcox Waste Heat Boilers

EACH of the 45 engines in the pumping stations of the Iraq pipe line is fitted with Spencer-Bonecourt waste heat boilers supplied by Babcock & Wilcox, Ltd., London. These boilers are horizontal units, 3′ diameter x 11′ overall length and each contains 170 sq. ft. of heating surface. The tubes are fitted with removable cores to accelerate heat transfer. Owning to the poor quality of feed water at some of the desert stations special provision has been made for easy cleaning. Steam from the boilers is used for evaporating purposes and for heating and is generated at 15 lbs. pressure.

On official test before shipment to Iraq one of these boilers developed 1½ lbs. of steam from feed at 60° F. to steam at 15 lbs. per sq. in. per BHP/hr. on the engine operating at full load.

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Klinger Jointings and Pressure Gauges

ALTHOUGH the main section of the Iraq pipe line has welded joints it has been necessary wherever special branches and connections to pumps occur to provide joints which can be easily broken and made tight again. In all these instances use has been made of joint rings cut from "Klinger-Oilit" joint material and fitted bolted flanges. This material is similar to the well known "Klingerit" jointing but the asbestos in it is bonded with special media which do not dissolve in hydro-carbons. Owning to the heavy pressures in the Iraq pipe line a strong and reliable jointing is essential. Many tons of "Klinger-Oilit" were cut up in the London works of Richard Klinger, Ltd. to supply the needs of the Iraq line.

Klinger reflex gauges are installed at points in the pumping plants where level indicators are needed and all Diesel engines in the pumping stations are fitted with Klinger sleeve-packed indicator cocks.

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Stream Line Filters

CERTAIN of the engines in the pumping stations on the Iraq pipe line are equipped with lubricating oil filters built by the Stream Line Filter Co., Ltd., London. A pipe attached to the main flow line continuously feeds a portion of the oil to the filter by means of which it is completely cleaned and returned to the sump. By this means the oil is constantly renovated and the solid contents of the sump are kept to a very low point. The filter itself consists of discs of specially prepared paper through which the oil is passed from outside to center core under pressure. The discs can be automatically cleaned and the sludge removed by turning a control valve.

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Laurence, Scott & Electromotors Auxiliary Motors

A LARGE number of direct current auxiliary motors are required for cooling water circulation, oil pumping and air compressor drives and for starting the main engines in the pumping stations on the pipe line. Seventy-six of these machines, varying from ¾ h.p. to 40 h.p., were supplied by Laurence, Scott and Electromotors, Ltd., Norwich, England. They are of special pipe ventilated type fitted with Vokes filters as a protection against desert sand and grit.

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Tanks, Roofs and Steelwork on Iraq Line

THE large number of tanks erected at the Mediterranean terminals of the pipe line are all equipped with Wiggins roofs. The fabrication and construction of these tanks was divided among four companies, The Motherwell Bridge and Engineering Company, Ltd., Motherwell, Scotland; Whessoe Foundry and Engineering Company, Ltd., Darlington, England; Chicago Bridge and Iron Works, Chicago, U. S. A., and Worms et Cie, Paris, all of whom are licensed makers of Wiggins roofs.

Seventeen 120′ diameter storage tanks equipped with Wiggins pontoon roofs at the Tripoli terminal were supplied and erected by Worms et Cie., Le Trait, France, in conjunction with Chicago Bridge and Iron Works.

The two British companies executed a joint contract for 19 storage tanks 120′ diameter by 46′ 6″ high of which 15 are located at the Haifa terminal while the others are placed at various pumping stations. In addition to this order the Motherwell Company supplied six fixed roof tanks, 50′ dia. by 40′ high for use at Kirkuk and the Whessoe Company built five tanks 118′ dia. by 43′ high equipped with Wiggins pan type floating roofs. The latter company also supplied 24 water storage tanks of special bolted construction and 2,500 bbl. capacity, besides 39 circulating water and fuel oil tanks in connection with the pumping plants.

Another interesting contract carried out by the Motherwell Company was the fabrication of trough-shaped steel plates used for roofing maintenance staff headquarters, involving 1,300 tons of steel. This company also constructed 16 wireless towers, each 80′ 0″ high for the oil company's wireless system.

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Kent Recording Meters

NUMEROUS recording meters of various kinds are required in the operation of the pipe line. Seventeen orifice-type oil and gas meters for pressure and flow recording were supplied by George Kent, Ltd., Luton, England. All of these were of the differential pressure operated mercury U tube type. The orifice fittings are so constructed that the plates may be readily withdrawn and others of different bore inserted. In this way a wide range of flows can be dealt with by the same recorder. When withdrawing an orifice plate pressure is cut off from the upper part of the body by means of an accurately machined, tapered plug. Mains to which orifices of this type were fitted were of 6″, 12″ and 16″ diameter.

The same company supplied 15 of its standard two pen pressure recorders and five mercury in steel temperature recorders, all fitted with 12″ diameter circular recording charts.

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Hopkinson Centrifugal Purifiers

FOR purifying the lubricating oil used by Diesel engines in the pumping stations along the pipe line twelve centrifugal oil purifiers have been supplied by Messrs. Hopkinsons, Ltd., Huddersfield, England. Incidentally, this is the largest single order for such equipment ever placed with a British firm. Each machine is designed to deal with 140 gals. of lubricating oil per hr. and employs a double purification process. First a solid extended skirt in the separating drum subjects the oil to a positive washing action in the zone of maximum centrifugal force, after which any remaining particles of dirt are separated from the thin film of oil during its travel along conical separating discs. The bowl is self-cleansing and no stoppages for the removal of sediment are necessary. Constant speed of rotation is ensured by a positive drive through gears which are enclosed in an oil bath.

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Negretti & Zambra Thermometers

RIGID stem type mercury-in-steel thermometers with which the Diesel engines on the Iraq pipe line are fitted were supplied to the company by Negretti & Zambra, London. Barnsbury type pressure recorders by the same makers are employed for measuring pressures on the pipe line.

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Delattre & Frouard Tanks

THE great tankage installation at the Tripoli terminal of the pipe line, comprising 15 tanks of 93,000 bbl. capacity each, was the work of a French syndicate headed by the Société des Etablissements Delattre and Frouard Reunis and including also the Société des Travaux en Fer de Maubeuge, Société des Etablissements Metallurgiques d'Onnaing and Société des Ateliers and Chantiers de la Seine Maritime (Worms & Cie). The same group also constructed 13 tanks of 30,000 bbl. capacity each in connection with pumping stations along the pipe line. The erection of the tanks at the terminal station was carried out by Delattre and Frouard, requiring the construction of temporary offices and workshops at Tripoli and the employment of a staff of the company's skilled workers during the period of construction.

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Scammell Lorries in Desert Transport

FOR the transport of line pipe across the desert special Scammell vehicles were built for the Iraq Petroleum Company. These were mammoth ten-wheeled vehicles, each capable of carrying ten tons of steel pipes up to 40 or 50 feet long. They were fitted with a special type of jib-crane for off-loading the pipes. The jib had a length of 24 feet and a lifting capacity of one ton at the extreme end and of two tons at half its length.

Extensive trials were carried out with the vehicle in England over the most severe country which could be found, and they were so successful that altogether orders for 21 vehicles were placed with Messrs. Scammell Lorries, Ltd., London.

One of these tests was a standard War Office test hill presenting a long sandy gradient of about 1 in 8, which was easily climbed from a standing start, while during a further test on the same gradient an effective stop and restart was accomplished, and finally a sudden stop during the descent affording convincing proof that the braking system was reliable. Each truck was fitted with low pressure pneumatic tires.

In its work in the desert this remarkable vehicle encountered conditions still more severe, for the Trans-Jordanian desert furnishes the most gruelling test for transport to be found anywhere in the world. In the lava country where the vehicles were used, the whole surface of the desert is strewn with large and small boulders of volcanic rock, which it is impossible to avoid.

The design and construction of the vehicles and the immense pneumatic tires enabled these formidable obstacles to be overcome while keeping the vehicle on even keel.

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Albion Motors

FIVE steel bodied lorries and three 1,000-gallon tankers for use in connection with the construction of the pipe line were supplied by Albion Motors, Ltd., Glasgow, Scotland. All were mounted on 35/70 h.p. bonnet type chassis fitted with 9.75" low pressure tires, single on front and twin on rear wheels. The cabs were open-sided with double roofs and safety glass windows. The lorry bodies were of all steel construction fitted with drawbar gear. The tankers were equipped with elliptical tanks and Broom and Wade air compressor with auxiliary drive for emptying trailer if necessary. All machines were fitted with low axle ratio, tropical cooling and air cleaners for the carburetors.

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Thornycroft Transport

MOTOR transport was the biggest part of the task of constructing the Iraq pipe line and a very large number of motor vehicles of various types and sizes were required to handle the great volume of pipe and machinery used on the line. For heavy transport a number of Thornycroft Amazon rigid 6-wheeled, 6-ton chassis were employed, each having a 14' 3" wheelbase, twin driving axles and a 6-cylinder 95 h.p. overhead valve petrol engine. To this was coupled an articulated 12-ton capacity pipe carrying attachment with a single trailing axle. Embodied in these units were special features such as extra size radiators, reserve tanks for water, petrol and oil, 12.75" low pressure Dunlop tires and special air cleaners.

Early in 1933 nine 2,500-gal. elliptical drinking water tanks built by Thompson Bros. (Bilitan) Ltd. and mounted on Thornycroft 16' wheelbase with 4-cylinder bogey axle attachments were constructed for use with the chassis already in service. These tanks were zinc sprayed internally and were equipped with hose racks carrying 40 feet of two-inch hose. Another type of Thornycroft vehicle employed was a 12-ton rigid 6-wheeled lorry with hinged side body, used mainly for carrying general stores and foodstuffs ahead of the pipe laying gangs. All these vehicles were built by John I. Thornycroft & Co. Ltd., London, and gave a very good account of themselves under the roughest possible working conditions in the desert and the lava country.

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International Paints Used by Iraq Company

A GREAT amount of paint was used by the Iraq Petroleum Company for the exterior protection of its many structures along the pipe line. The greater part of this was supplied by The International Paint and Compositions Company, Ltd., London, and was manufactured at their main factory, Felling-on-Tyne, England. This company has specialised for many years in the manufacture of paints for the oil industry. Through its worldwide organization and its experience in many countries it has been able to overcome difficulties due to peculiar and exceptional climatic conditions. In Iraq, for example, atmospheric conditions and the wide range of temperatures encountered demand a paint which will retain its elasticity over a long period and thereby escape the cracking and flaking which otherwise would result through continual expansion and contraction. This has been one of the special considerations kept in view in manufacturing the paint used along the Iraq pipe line.

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British Drug Houses

IN AN undertaking of the size and character of the Iraq pipe line the health of the personnel is a primary essential. Adequate provision not only of hospital facilities and health inspection but also of medical supplies assumes special importance in view of the remoteness of the work from established sources of supply. Evidence of the fact that this was recognized by Iraq Company officials is afforded by the thoroughly equipped medical organization. The supply of drugs, chemicals and medicines was in the hands of British Drug Houses, Ltd., London, whose products are marketed under the brand B.D.H. which is recognized in hospitals and dispensaries throughout the world as a mark of purity and dependability. The company exercises a strict scientific control over all manufacturing processes and applies rigid physical, chemical or biological tests to all products before they are issued. The company manufactures not only drugs and chemicals used as medicines but also chemical substances regarded as medical accessories and other accessory products such as microscopic stains used in bacteriological and pathological laboratories for the detection of disease. The B.D.H. also makes many animal products widely employed in medicine such as insulin for the treatment of diabetes, glandular and hormone preparations.

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Ruberoid Asbestos Pipe Line Felt

YEARS of careful study and research on the problem of the preservation of pipe lines resulted in the development of Ruberoid Imperial Asbestos Pipe Line Felt, which was used to protect the great Iraq pipe line running across the desert from Kirkuk to the Mediterranean.

The material is 99 percent pure asbestos felt, free from rag hair, wood or paper stocks, or any other materials that are destructible underground. The asbestos felt was thoroughly saturated with pure asphalt, one of the finest weatherproofing materials known to man. It has unusually high tensile and mullen strength to enable it to withstand tight wrapping and to resist soil distortion.

As asbestos is itself non-capillary and non-tubular and is chemically inert, it affords protection against electrolysis and stray current.

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Cochran Boilers to Heat Iraq Stations

FOR the heating and domestic supply services in the residential quarters of the twelve pump stations along the pipe line the engineers of the Iraq Petroleum Company accepted the tender of Cochran and Co., Annan, Ltd., Annan, Scotland. At each of the single line stations pairs of 3' 0" and 4' 9" diameter boilers are installed while the main junction station, being larger, has one 3' 0" and one 5' 6" dia. boiler.

These boilers are oil fired and hot water heating. Their all-steel construction, special furnace design, internal accessibility and structural strength makes them especially suited to oil firing and to use where every possibility of breakdowns and repairs must be eliminated. The company has over 200 installations in storage depots of various fuel oil marketing companies.

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Marconi Wireless

IN ORDER to meet the necessity of prompt communication along the course of the pipe line a chain of Marconi wireless was built through Iraq, Syria and Palestine. Two of the stations are situated on the eastern section of the line, at Baiji and Haditha. The northern and southern lines, between Haditha and the Mediterranean are served by three stations each. The service thus provided constituted the most rapid and complete system of cross desert communication in the world. Since the completion of the pipe line it is being continued as part of the maintenance service.

While the wireless stations operate normally on the Morse system they are arranged for both telegraph and telephone service. The transmitters have an energy of 500 watts with the power supply generated through the medium of a small petrol engine. The receivers are of special four-valve design, combining efficiency with simplicity and robustness.

An extension of the wireless communication system along the pipeline is now being arranged. For this service short-wave transmitting and receiving stations have been ordered from Marconi Wireless Telegraph Company, Ltd., London.

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Travel to the Near East

ALONG with the industrial development of the Near Eastern countries symbolized by the building of the Iraq pipe line has gone a great increase of interest in and travel to that part of the world. This is due in part no doubt to the greatly improved travel facilities now provided. By plane it is now possible to hop from London to Baghdad in four to five days by any one of three routes regularly in operation. The famous Simplon-Orient express takes but little longer enabling the trip from England or France to Syria and Lebanon to be made in four and a half days, to Palestine or Egypt in six days and to Persia in seven days. For more leisurely travelers the finest of steamship accommodations to the ports of the Mediterranean are available. With the luxurious facilities available and the ease of arranging trips of any length or duration through such international agencies as Thos. Cook & Son, Ltd., the drudgery of travel is eliminated and only its pleasant features remain.

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Electrical Equipment

A WIDE variety of electrical equipment was required in the construction of the Iraq pipe line and appurtenant buildings, including 500 ceiling fans for the administrative offices, 50 floodlights for illuminating the pumping stations, large quantities of rubber-insulated cable, many small motors, switchgear and accessories and several thousand Osram lamps for general use. All this equipment was supplied by General Electric Co., Ltd., London.

All of this equipment had to be adapted to service under exacting climatic conditions. Narrow angle enclosed floodlights of a particularly robust type fitted with special gaskets to withstand atmospheric changes and prevent the entry of sand were installed. The cable which was manufactured at Pirelli-General Cable Works, Ltd., Southampton, included single-core braided, with special non-corrosive compound over the braid, twin lead covered and tough rubber sheathed flexible cable and cords. All these were supplied in 2,500 meg. "Vicma" grade insulation especially designed to meet the conditions experienced in Iraq.

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Vokes Air Filters

To meet the conditions created by extremely high temperatures and by frequent sandstorms filling the atmosphere with fine dust, air filtration plays an important part in the operation of the engines along the Iraq pipe line. All the Diesel engines, electrical generators and compressors are fitted with air filters made by C. G. Vokes, Ltd., London. These include oil and fuel oil filters, compressed air pipe line filters and "protectometer" units of various sizes such as have been supplied to a number of oil companies operating under similar climatic conditions.

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Caterpillar Tractors and Trailers

For moving supplies across the roadless waste of the desert where rocks and sun dried dust alternate to make transit almost impossible a fleet of eleven "Caterpillar" tractors was purchased by the Iraq Petroleum Company at the beginning of construction. The first task of these tractors was the hauling of pipe and loads of from 50 to 70 tons were handled by these big machines with special Athey trailers that accommodated two big stacks of pipe. On the sandy stretches hauling conditions became almost impossible for ordinary wheeled vehicles as soon as the surface crust was broken. It was here that the track-type machines proved their special value because the wide distribution of weight enabled them to traverse such areas without breaking through. Likewise when rocks barred the way or rains turned the river valleys into quagmires the tractors and trailers bore the brunt of the burden. The tractors of this type were supplied by the Caterpillar Tractor Company, Peoria, Illinois, and the trailers by Athey Truss Wheel Co., Chicago.

"Nesher" Portland Cement

Large quantities of cement used in the construction of the Iraq pipe line and auxiliary buildings were supplied by the Portland Cement Co. "Nesher" Ltd. from their works at Haifa, Palestine. This company also supplied the cement used in construction of the extensive harbor works at Haifa, including the main breakwater and two jetties aggregating some 2,000 ft. in length. Cement produced by this company has been used in most of the government works in Palestine. For the purposes of the pipe line "Nesher" cement, in addition to its high quality, presented the advantage of prompt deliveries at short notice, obviating the necessity for maintaining stocks and erecting storage.

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Cables and Conductors

In connection with the telephone and telegraph line of the Iraq Petroleum Company over 5,600 miles of Cadmium copper wire, besides conductors, insulated cable and armored submarine cable were supplied by British Insulated Cables, Ltd., Prescott, England. For the Tigris and Euphrates crossings the company supplied 26,400 ft. of high tensile conductors of steel-cored copper wire which combines the good mechanical characteristics of steel with the non-corroding qualities of copper. For lighting and other purposes British Insulated Cables supplied a total of 78,000 ft. of cable of various kinds.

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Ocean Transport

Of the pipe manufactured on the European continent for the Iraq pipe line the greater part—some 50,000 tons—was transported to Haifa and Tripoli by the Christen Smith fleet of craneships, operated by Belships Company Ltd., London, which are especially equipped for handling heavy equipment. In the case of the Iraq pipe special hooks and lifting arrangements made it possible for one derrick to lift three 40-ft. pipes at one time.

Pipe manufactured in the United States was transported by the Export Steamship Company, New York, which maintains a special service of freight and passenger steamers to Mediterranean and Black Sea ports.

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Design and Equipment of Lobitos Refinery

In an article descriptive of the Lobitos refinery, published in the January issue of World Petroleum it was stated that the refinery was erected under the supervision of Harold Moore of the well known engineering firm of Moore and George Ltd. This statement was correct but from a subsequent passage in the article readers might have gained an impression that Messrs. Moore and George were responsible only for a minor part of the plant. As a matter of fact the general design of the refinery was prepared in the offices of Moore and George Ltd., the specifications were drawn up by the company's engineers and the erection of all storage, handling and treating equipment was supervised by the resident engineer of the company at the site. In the interest of complete accuracy World Petroleum desires to make it clear that Messrs. Moore and George Ltd. were in charge of all parts of the work except the design and erection of the distillation unit which was in the hands of Alco Products Inc.

On page 29 of this article appeared an illustration showing a flow controller, temperature controller and flow meter manufactured by Mason-Neilan Regulator Co., Boston, Mass. The recording potentiometer shown in the list of equipment accompanying the article was furnished by Leeds and Northrup, Philadelphia, instead of by the Foxboro Company as stated. The Foxboro Company, Foxboro, Mass. did supply the other recording and control instruments including the level controls.

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New Diesel Efficiency

A thermal economy hitherto unattained by any heat engine has been achieved by two Sulzer, two-cycle, marine-type Diesel engines of 5,500 b.hp. when under test at Winterthur, Switzerland, for the New Zealand Steamship Company. The fuel consumption at full load was 0.329 lb. per b.hp. and 0.326 lb. at three-quarters load running on oil having a calorific value of 18,270 B.Th.U./lb. hence, at full load the thermal efficiency was 41.7 percent. These twin eight-cylinder engines are single-acting, and have their compressors driven off the main crankshaft, the latter fact making the low consumption all the more noteworthy.

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Refinery at Haifa

Haifa, January 16.

The Shell Company of Palestine, controlled by the Consolidated Petroleum Co. (Anglo Persian Oil—Asiatic Petroleum) is erecting a refinery at Haifa, Palestine on the terminus of the Iraq pipe line's southern branch. Until now, there have been rumors that the I.P.C. itself would erect the Haifa refinery, but obviously the former project has been altered. The Haifa refinery of the Shell-group, of course, may be erected on good terms with the Iraq Petroleum Co., the Shell-group and the Anglo-Persian Oil being important shareholders in the I.P.C.

The new refinery will have a capacity of about 180,000 tons per year. This capacity is sufficient to cover the requirements of Palestine, amounting in 1934 to about 110,000 tons including motor spirit, kerosene, lubricating oil, fuel oil, mazut and gas oil. Palestine's consumption has recently been increasing rapidly.

Confusion of Counsel Muddles Washington

Conflict Between Advocates and Opponents of Federal Regulation Renewed by Supreme Court Decision—Congress Inclined to Limit Action to Authorization of Inter-State Compact.

IN THE welter of conflicting claims and opinions at Washington certain sign posts are visible. One of these is to be found in recent statements of President Roosevelt that the country is headed for oil control to prevent waste in production and to achieve a reasonable stabilization. This of course leaves open the question how stabilization is to be accomplished.

Immediate action to make possible a continuation of the federal tender system that had succeeded in staunching the flow of hot oil in Texas was proposed in the flurry that followed the Supreme Court decision invalidating Section 9(c). Senator Connally of Texas, Senator Gore of Oklahoma and Representative Disney of Oklahoma all introduced bills designed to accomplish this purpose. The Connally bill was passed by the Senate January 22 and undoubtedly will be approved by the House. It is perhaps significant that after introduction of the bill Senator Connally eliminated the words "or Federal" from the section defining contraband oil as any oil produced or handled in violation of any "State (or Federal) law or valid orders." Thus the authority of the federal government will be confined to enforcing limitations imposed by state laws and regulations.

Opponents of federal control have been moving on Washington in force prepared to fight against any legislation by which the central government could determine the quantity of oil to be produced within a state. Jack Blalock, spokesman for Governor James V. Allred of Texas, who told the recent conference of governors at Ponca City, Oklahoma, that Texas was "unalterably opposed" to having federal authorities decide how much crude oil should be produced in the state and would not even accept as binding quotas fixed by an interstate compact, has hastened to the national capital to uphold these views. Commissioner E. O. Thompson of the Texas Railroad Commission also is on the ground to oppose federal regulation. He told members of the Texas Congressional delegation:

"We need Federal regulation of interstate movements, even though we feel the state can handle the production situation. Texas will not permit any invasion of its rights, such as might result if a bill should be passed which would provide that the federal government's allocation of production to Texas was mandatory. We are just old-fashioned enough to believe that the development of Texas' resources is properly a question solely for determination by Texas, with an avowed policy of preventing physical waste."

The leading representatives of Texas in the Senate and House are violently opposed to any legislation that will restrict the state's authority to decide how much oil shall be produced within its borders. The voice of Texas is so powerful in Congress that it is unlikely that any bill unsatisfactory to the Rayburn-Garner-Connally group can be passed unless the President himself demands it. Representative Rayburn of Texas, chairman of the House Interstate and Foreign Commerce Committee which handles oil legislation, is looked upon in political circles as the man who blocked the Disney-Thomas federal control bill last year. In a speech delivered January 11 he said:

"I was opposed last year, as everybody knows, to the Disney oil bill. I am not going to vote to make any one man dictator of the third largest industry in America, as was proposed in that bill. I am for the states . . . controlling the production of oil and its distribution. But if they cannot do it, then a higher authority must step in. Let me add this: Texas of course is the 'Devil' in the oil business. The East Texas field is what brought about all this talk of controlling the production of oil. There has been much said about 'hot' oil. The State Commission of Texas is trying to control this."

The sub-committee of the House Interstate and Foreign Commerce Committee which is known as the Cole Committee has been investigating the oil situation in a more or less desultory way during the past six months. The committee submitted a preliminary report January 5 but in view of the then pending cases before the Supreme Court made no definite legislative recommendation. Those who have followed the proceedings of the committee realize that it is opposed to federal regulation and leans toward the state compact idea.

The one proposal on which those in attendance at the Governors' conference were able to unite was a request to Congress for a law authorizing the formation of interstate agreements. There appears to be little or no opposition to such a measure. There seems to be little hope of efficient control through an interstate compact, however, in view of the position of Gov. Allred who is just as much opposed to letting Oklahoma or California have anything to say about production in Texas as he is to letting the federal government have such authority.

In the "backroom" arguments with which opponents of federal regulation are busying themselves much use is being made of the alleged threat of Secretary Ickes that oil will be declared a public utility. Circulation of this report together with some of the Secretary's plain speaking undoubtedly has intensified opposition to the Oil Administrator in Texas and elsewhere.

In reality the "threat" of the Secretary was rather in the nature of a warning that unless some effective program of conservation could be worked out with the support of the industry the government might be compelled to assume control. It undoubtedly is his conviction, however, that a federal control law is needed to deal with the situation. The Secretary's unpopularity with Congress is due to quite other reasons but is strong enough to create decided opposition to any measure that he sponsors or supports.

The Planning and Coordination Committee, by a vote of 11 to 9 in December, recommended legislation providing for quotas-in-commerce in petroleum and its products, with provision for interstate compacts among the producing states. This is the idea developed by Judge Beaty, former chairman of the committee, as meeting legal obstacles to federal regulation. The American Petroleum Institute, through its directors, has urged the continuation of Section 9(c) and

authorization of an interstate compact. The Independent Petroleum Association has stood steadily for federal regulation to "assist the oil states in their efforts to protect themselves against law violators and groups who would loot their neighbors' oil fields." In a report submitted to the National Resources Board on January 12 the Planning Committee for Mineral Policy urged that the oil industry continue under private initiative although subject to some supervision, particularly for control of production.

These are the diverse interests and views contending for recognition in Washington at present. To those familiar with the conditions that prevailed in the summer of 1933 when the oil code was being whipped into shape the present situation is reminiscent of that time. The same faces are to be seen and the same general contentions are heard.

Experienced political observers are inclined to believe that some kind of an oil bill will be passed by Congress at the present session but most of them agree that it is much more likely to be the kind of measure acceptable to the Texas lawmakers than the sort of act authorizing direct and vigorous eradication of hot oil which Secretary Ickes would like to see. As usual in Washington nowadays all these prognostications are qualified by an "if." If the President demands from Congress a strong and enforceable oil control law he will get it.

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Who Upsets the World's Markets?

Russians Give Their Version of Price Cutting Controversy — Repel Accusations — Hold Overcapitalization Responsible for Unbalance.

By A Member of Soyousnefteexport.

THAT the efforts heretofore made to stabilize the international petroleum market through voluntary limitation of production or exports have met with scant success is a matter of common knowledge. When it comes to assigning responsibility for this situation explanations differ widely. For a time the Soviet Union was held up as a chief culprit in price cutting but this charge is vigorously denied in the accompanying article which was prepared by a leading member of Soyousnefteexport, the official Soviet exporting organization, who adduces statements and figures to show that their export prices are higher than some of their competitors. World Petroleum presents the statement herewith without prejudice.

IN THE world petroleum industry the unfavorable conditions that have prevailed for the past few years are continuing with unabated force. It is true that 1933 and 1934 brought an increased demand but it was of small proportions in comparison with the sharply augmented production. The rise in demand in 1933 as compared with 1932 was two percent as compared with nine percent increase in output.

With supply continuing to outstrip demand in this fashion a continued fall in world prices for the more important petroleum products is not surprising. A few figures of petroleum prices in gold dollars, taken from a well known marketing publication, will illustrate the extent of this decrease:

Decline in Average Annual Prices in 1933 as Compared with 1932.

Product	Decrease percent
Petrol	21.6
Kerosene	21.9
Gas oil	14.6
Machine oil	18.3

The fall in prices has continued during the greater part of 1934. A characteristic feature is the breakdown of every effort on the part of the oil industry itself or on the part of governments to bring about stability in the oil markets. During 1933 there was the breakdown of restriction in the United States, the breakdown of the Paris agreement with Roumania respecting exports, and finally there is the collapse of the Petroleum Code which has not justified the expectations placed in it for the stabilization of the American petroleum market.

Such are the facts and thinking persons will find no great difficulty in explaining them.

Stabilization Efforts Fail

Former large profits of petroleum concerns and the fierce struggle for the world's petroleum resources and markets have led to a feverish, sporadic growth of the industry. For many years overcapitalization has been going on—overcapitalization expressing itself in overproduction. While a rapid expansion of motor transport was going on and the consumption of petroleum products increased at a speedy rate those who had the control of petroleum development managed to hide the obviousness of overproduction. For a number of years the big capitalistic organizations endeavored to convince the public that a petroleum famine was approaching; in other words that overpro-

duction was justifiable in view of the impending scarcity. The world economic crisis brought to an end this illusion which many, in good faith, had accepted.

In order to illustrate the rapid growth of investment in the world petroleum industry it is enough to give figures for the United States and Roumania. In the former the capital investment in petroleum amounted in 1927 to $11,200,000,000 but in 1933 it exceeded $16,000,000,000. In Roumania, in 1926, eight milliard leis were invested and in 1932 the amount had grown to 11.3 milliards. How significant the overdevelopment is may be seen from statements made in the petroleum press that three localities in the United States—Texas, Oklahoma and California—would be able, if required, to meet the entire world demand.

"Planning" Possible Only in U.S.S.R.

The existence of irreconcilable contradictions among the world trusts, between the trusts and the independents, and between producers and consumers, led, on the one hand, to an uninterrupted expansion in the sphere of exploration, production, manufacture and export. On the other hand it resulted in a steady contraction of the possibilities of realizing that expansion in the ordinary way of trade. Hence there is no reason for surprise that all efforts at "planning" the petroleum industry on a national or world basis have come to naught. Planning is possible only in the U.S.S.R.

Overcapitalization creates a condition of chronic overproduction. This affects the market even under circumstances of restriction, because the market is influenced not merely by actual output but also by potential production. These potentialities are so important, they eclipse future market demands to such an extent, that a more or less prolonged stabilization of the market is, generally speaking, out of the question.

This, however, does not imply that the U.S.S.R., so far as it is concerned, has taken up a negative attitude toward the plans for regulating the world petroleum market which have been put forward by the world trusts, provided that the plans are not affected by anti-Soviet tendencies. These plans at best are merely palliatives, but the U.S.S.R. is not opposed to palliatives. The Soviet oil policy is opposed to the spirit of expansion and aggression and it cannot help seeing that certain trusts at all times have manifested the keenest aggressiveness and the spirit of unlimited expansion.

The Soviet oil exporters never have been opposed to negotiations with the international oil companies for the rationalization of oil markets.

Sir Henry Deterding has declared that there is no point in calling together a world conference on petroleum so long as the Americans have not put their affairs in order. On the other hand Mr. Harry Sinclair has said that if the European states will put their affairs in order the Americans will manage their business the better and referred to the case of Holland where petroleum products were being sold at a loss. Mr. Sinclair stated further that the U.S.S.R. has done nothing to disorganize the market.

Who Is to Blame?

Writing in THE MINING JOURNAL of London in February, 1934, Mr. J. B. Aug. Kessler dealt with the question of culpability for the present difficult position of the world oil market.

Soviet Consumption of Petroleum Products in 1932 and 1933

Products	1932 Tons	1933 Tons	Plus/minus	Percent
Petrol and ligroin..	894,861	1,064,877	+ 170,016	+19
Kerosene.....	3,027,720	3,189,203	+ 161,483	+ 5.3
Lubricating oils...	734,810	780,930	+ 46,120	+ 6.3
Mazout (fuel oil)...	8,359,091	6,767,462	−1,591,629	−19
Diesel and gas oils.	1,235,328	1,338,616	+ 103,288	+ 8.4
Others.....	108,530	111,740	+ 3,210	+ 2.9

The article may be summarized as follows: For the present difficult state of the world oil market America and the U.S.S.R. must be held responsible. The latter carries on a policy of dumping which finds its expression in a great gap between home and export prices. The U.S.A. is taking advantage of the depreciation of the dollar, of the limitation of imports and of increased production to increase its exports. All the other countries are ready to cooperate in carrying through a constructive policy for the purpose of restoring the balance between demand and supply. Only the U.S.S.R. and the U.S.A. hinder the accomplishment of this movement, according to Mr. Kessler.

The article closes with a significant statement. Other countries, says Mr. Kessler, speaking apparently as the representative of these countries, have an out-of-pocket cost of production greater than that of the U.S.A., yet in their struggle to maintain their position on the market they too aid in bringing down prices.

Evidently the Joint Manager of Royal Dutch-Shell is greatly dissatisfied with his chief foreign competitor, which, after having reduced its exports for a number of years is now somewhat increasing them. The note addressed to America is sharply worded. This, however, is a digression from the question of "Russian dumping." As evidence of this Mr. Kessler refers to Russia's home and export prices for petrol and kerosene. To make the showing more effective he puts side by side f.o.b. Batoum and retail domestic prices. A considerable divergence naturally obtains.

Export and Retail Prices

In the nature of things wholesale prices f.o.b. shipping port and retail prices in interior points are not comparable. Furthermore, Mr. Kessler chooses for his exhibit the highest retail prices of the first zone which relate to distant places situated 10,000 to 12,000 kilometers from the point of production and from which point petroleum products are delivered by rail. Such transportation costs are high. A comparison of f.o.b. prices with retail prices shows nothing under other circumstances, but is even less informing in the U.S.S.R. where the latter prices frequently are of a quite conditional character. Mr. Kessler ignores these circumstances and by comparing things that are unrelated he draws conclusions that are misleading to the reader.

The decisive point in this matter is ignored by Mr. Kessler. That is the relation of Soviet export prices to the prices f.o.b. Gulf and f.o.b. Constantza. For this purpose let us take the export prices of the U.S.S.R. as Mr. Kessler states them and compare them with average world prices.

Soviet and World Export Prices

(Gold Roubles per ton)

	Soviet export prices	F.O.B. Gulf	F.O.B. Constantza
Petrol.....	R 30	R 23.60k.	R 25.42k.
Kerosene.....	R 23	R 20.29k.	R 15.47k.

It certainly would require much ingenuity on the part of Mr. Kessler or anyone else to convict the Soviet Union Petroleum Export of trading at give-away prices when actual quotations are higher than other world prices.

What is the position in the U.S.A. and in England? Export prices f.o.b. Gulf are considerably lower than the prices f.o.b. refining points in the U.S.A. On August 13, 1934, motor gasoline f.o.b. Gulf was 4.12 to 4.25 cents per American gallon, while f.o.b. California refining gasoline, 58–61° Beaume, cost 8.50–9.50 cents. In Ohio motor gasoline cost 7 cents per U. S. gallon.

In England world prices and prices on the English market leave the Combine from 33 to 43 shillings per ton to cover all transport and distributing expenses which quite clearly makes it unprofitable for them. Prices on the English market are determined by the Combine and in the Combine Shell plays first fiddle.

Nevertheless the spread between prices f.o.b. Gulf and the prices at which petrol is sold on the English market is very great. After the latest price decrease the price f.o.b. Gulf for commercial petrol was approximately $15.22 per ton and the pump price was $93.68. Still the price cannot be profitable to sellers and this shows that the comparison of f.o.b. prices with retail market prices is absurd.

The accusation of "dumping" made against the U.S.S.R. means, if it means anything, that the Soviet Union is selling below world parity; that by imposing high home prices it brings its export prices below the world level. This is sufficiently answered by the comparison cited above.

Consumption in Soviet Union

Not content with accusing the U.S.S.R. of dumping Mr. Kessler evinces great anxiety about the consumers in the U.S.S.R. He affirms that Soviet prices were so high as to lead to a decline in consumption in 1933 and he supports this contention by figures that are incorrect. As a matter of fact Soviet consumption in 1933 rose considerably over 1932 as shown by the accompanying table in which the figures are stated in tons.

In 1933 the U.S.S.R. used a greater quantity of petrol and kerosene, the two products of which Mr. Kessler speaks. It showed a decline in fuel oil (mazout) the chief consumers of which are industry and transport. This decrease in fuel oil consumption is due to the fact that industry, and to a less extent transport, has been electrified, while another section of industry has gone over to the use of local fuel. Thus Mr. Kessler's concern about the consumer in the Soviet Union loses any point it otherwise might have had.

Increases in Production

In considering the disruption of the world market there seems little reason why this particular critic should assume the part of outraged innocence. Production figures for 1933 show an increased output in Venezuela where Shell produced 7.6 million tons against 7.3 in 1932. There was an increase in Roumania where Anglo-Dutch interests control 34 percent of production, 61 percent of refining and 40 percent of export. In the Dutch East Indies where these interests hold almost undisputed sway there was an increase of nearly 1,000,000 tons. In Persia where the Anglo-Persian is the sole operator there was an increase of more than 600,000 tons. It is not to be denied that there was overproduction in the United States in 1933 by more than 15,000,000 tons as compared with 1932 but Royal Dutch-Shell itself is responsible for a share of the increase in world production and exports.

There are other disturbing factors on the world's market. During 1933 Roumania went in for extended exploration work while its home consumption remained still extremely low. Again there was the feverishness of activity in Iraq. The hurried construction of a pipe line more than 1,000 miles in length, the construction of harbors and refineries at a time of protracted overproduction can only be regarded as an attack on world markets and on all those exporters who do not belong to the interested groups of which the Anglo-Dutch group is one influential member.

Finally reference may be made to the fierce price wars which prevailed during 1933 and 1934 in China, India, South Africa, New Zealand, Japan, Sweden, Manchuria and England. In these wars one of the chief participants has been the organization in which Mr. Kessler is one of the chief executives and in many of them the spearhead of attack has been directed against the exports of the Soviet Union. Particularly noticeable has been the aggressiveness of Shell toward Soyouznefteexport in England.

In the past year the struggle to reshape world resources has increased. The struggle to reshape petroleum resources in the Mediterranean and the Indian Ocean has become particularly acute. On account of the anarchic policy pursued the capacity of markets becomes more and more overtaxed. With the intensification of the struggle for outlets in connection with the appearance of Iraq oil and with the collapse of the petrol pool in the United States a further disruption of the world market may appear inevitable but responsibility for this cannot be put on the U.S.S.R. The facts are too clear for this claim to be accepted seriously.

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Torbanite Plant for South Africa

EXPLORATORY tests conducted by the British Burmah Petroleum Company, Ltd., are accepted by the latter as demonstrating that there is no prospect of discovering oil in commercial quantities by drilling. The company has turned its attention therefore to the development of the South African oil shale deposits. A company known as the South African Torbanite Mining and Refining Company, Ltd., in which British Burmah is understood to hold a one-third interest has been organized with a capital of £750,000. The company proposes to work the extensive deposits of torbanite existing in South Africa and will erect a plant in the Ermelo district near Johannesburg for oil distillation and refining. Messrs. John Taylor and Sons are managers for the company.

It is reported on good authority that the company has placed an order with Salermo Ltd., London, for two low-temperature distillation retorts capable of treating 150 tons of crude torbanite per day. A yield of about 100 gallons of crude oil per ton of torbanite is expected. Petrol, lubricating oil and fuel oils will be extracted by refining. The plant is to be completed in readiness for operation in about twelve months.

The Salermo retort has been developed over a number of years and it is in successful operation on coal in Great Britain and elsewhere. It operates at low temperatures and the maximum temperature reached in the material is of the order of 450° C. The retort is externally heated and in principle consists of a series of semi-circular metal troughs placed side by side, each trough being fitted with a shaft and paddles. There is a slow progressive motion of material through the retort while the material is being agitated continuously. In this way are secured repeated brief contacts of small particles with a heated surface and of particle with particle, so largely increasing the opportunities of heat transfer. The oil vapors are evolved freely and at no time do they come in contact with strongly heated surfaces. In this way and with the rapid removal of the vapors, it is asserted that a maximum yield of uncracked oil can be obtained and that the oil is remarkably free from dust.

Alcohol Situation Disturbs French Oil Trade

Impossible to Absorb Rapidly Rising Output of Distilleries—Termination of Marketing Cartel Brings Danger of Serious Price War.

By H. O. Beatty

THE petroleum industry of France occupies a peculiar position. Conducted by private organizations for their own profit it is so closely regulated that the government at all times can have a preponderant voice in its affairs. In relation to oil the government has in effect all the advantages of a monopoly without its responsibilities. Within the past few years some two billions of francs have been invested in the building up of domestic refining facilities which when completed will more than supply the country's requirements while import permits still outstanding allow the bringing in of petroleum products in sufficient volume to satisfy the greater part of its needs. The possibilities of acute price conflicts presented by this situation are obvious. At the same time the petroleum industry is compelled to absorb rapidly growing quantities of government favored alcohol. As a result of these conditions the industry faces an uncertain and disturbing outlook.

PETROLEUM companies operating in France enter the new year with prospects that are far from reassuring. The alcohol problem, which for a long time past has been a troublesome one, is assuming menacing proportions. More immediately serious, though possibly less difficult to deal with in the long run, is the break-up of the cartel which has been in effect for a year past. There are other troubles but these two are the cause of most acute concern at the moment.

As is well known the petroleum policy announced by the government several years ago has led to the rapid upbuilding of the refining industry in France. Since the liberality with which permits were issued made it evident two years or more ago that the capacity of refiners to supply would presently be in excess of the market's capacity to absorb it was foreseen that some understanding as to output must be reached in order to avoid a competition disastrous to the refiner and the market alike. All the more so was this essential by reason of the peculiar advantages possessed by the Compagnie Française de Raffinage. Slightly less than one-third of the capital of this company is owned by the government which, on account of its paramount interest, reserved to the company the right to produce 25 percent of each year's anticipated consumption. While the Compagnie Française de Raffinage has adhered since its organization to the principle that its operations would be confined to production only, leaving the marketing of its products to private distributing agencies, the group of private refiners is plainly obliged to regulate their output to only three-quarters of what the public may be expected to purchase. Up to the present time the company has not availed of its right to the full amount of the 25 percent reservation in its favor because of the non-completion of its construction program.

In May, 1934, after a long period of negotiation the refiners finally signed an agreement which stipulated the quotas of production to which each would be entitled. The quotas were based on the above expected consumption!

Estimated French Demand

Product	Tons
Gasoline	2,411,800
Kerosene	236,400
Gas oil	374,800
Lubricating oil	315,500
Fuel oil	2,370,000
Total	5,708,500

THE negotiations were extremely delicate and were rendered all the more difficult because of the more or less anomalous positions in which the contractants were placed. Each had to be considered from his own individual standpoint. In some cases the construction of their refineries had only just commenced. In other cases the refiner was in position to fill the amount of his quota at once. Some possessed a perfect distributing system; others possessed none at all, or one only partially able to respond to the needs of his quota. To place them all on an equal footing demanded the elaboration of an exceedingly complicated system of cessions and withdrawals of products with a view to trimming advantages here and filling gaps there. There was much for which it was impossible to make either adequate or definite provision at the time. These matters were provided for by the definition of the principles according to which such questions should be determined accordingly as the necessity for decision should arise.

Some central agency was evidently necessary to give effect to the provisions of the accord reached between the refiners. Several in fact have come into being. The central and principal organ is that known as the Chambre Syndicale des Raffineurs. It is the duty of this body to represent the group in its relations and dealings with the government and public authorities. Through its secretary-general and the various committees established the necessary exchanges of products, their cessions or withdrawals are decided and arranged. Upon it reposes a subsidiary body, the Comité des Fuels, to which is confided the function of adjusting all questions relating to gas oil and fuel oil.

Parallel with the Chambre Syndicale des Raffineurs is the Chambre Syndicale de l'Industrie du Pétrole. The latter body is constituted by the various distributing organizations, whether independent or affiliated with individual refiners. Its functions may be said in general terms to cover all matters of interest to the trade in white products. Here also

was reached a general accord among the distributors defining their respective interests and rights. Due to dissatisfaction with the manner in which it was functioning this accord has been denounced by a number of members. It will cease to be in force from February 1 and unless some new agreement can be arrived at before that time a chaotic marketing situation may result.

Still a third and somewhat similar body exists, the Chambre Syndicale des Importateurs des Huiles de Graissage, organized to promote the interests of this important branch of the industry. In addition to lubricating oils it is charged as well with the promotion of the trade in asphalt.

In order to harmonize the efforts of the three chambers and to avoid possible conflicts, their presidents have been formed into a committee called the Comité du Pétrole. It is through the agency of this committee that the relations of the government and the industry as a whole are maintained.

Alcohol a Special Problem

THE alcohol problem as it affects the petroleum trade is of an entirely different nature. It has grown out of the desire of the government to favor the beet sugar and wine industries of which alcohol is a by-product. There was a time when France was unable to supply from home production the amount of sugar required for private consumption or to satisfy industrial demands for alcohol. When war was declared in 1914, it was found necessary to import vast quantities of alcohol in order to supply the munition factories. Since importations in war time are uncertain and extremely costly, one of the first concerns of the nation after the reestablishment of peace was to set about providing a supply for future contingencies capable of responding to any possible need. Obviously the most practical course to pursue was to stimulate the cultivation of the sugar beet, since long experience had proved it to be well adapted to French soil and climate. With adequate crops anxieties as to a domestic supply of alcohol would be set at rest.

The engrossing interest of the state in the production and disposition of alcohol was recognized in 1916 when, on June 30, a law was voted transforming the industry into a government monopoly. For the purpose of coordinating efforts and giving practical effect to the monopoly an administrative body known as the Service des Alcools was created. It is through the institution of this service that the production of alcohol, so fundamentally vital to the security of the country, has been brought to its present flourishing state. The Service des Alcools is charged not only with the exclusive control of the purchase and sale of the product but has as well the authority to give the industry the propulsion necessary to assure the country against every eventuality.

The offer made by the government through the Service des Alcools to the farmer in order to induce him to engage in a more extensive cultivation of the sugar beet was the agreement to purchase all alcohol that might be distilled therefrom according to a scale of prices fixed in such amounts as to assure him a definite profit. In other words it was the offer of a very handsome subsidy. The response was immediate. The sugar beet acreage began at once to increase and has been steadily increasing ever since. The ratio of increase of late moreover has been greatly strengthened by other factors perhaps unforeseen.

There is no better preparation of the soil for the cultivation of wheat for example than a crop of beets. The excessive yields in wheat of the last several years are due no doubt in large measure to the impetus given to the planting of beets. There has resulted from this fact a practical demonstration of the vicious circle. The more there are of beets, the more there is of wheat. Since the very considerable excess stocks of the latter represent a heavy loss to the farmer, it is not surprising to find him inclined to abandon an article of produce which brings him no return, or even worse, in order to devote his labor to the cultivation of another from which he is sure to derive a substantial gain. The consequence of the measures taken has been to load upon the government a supply of alcohol entirely out of proportion to its needs or the capacity of natural markets to absorb it.

A better appreciation of the efforts of the Service des Alcools may be obtained from the accompanying table.

Growth in Annual Alcohol Yield

Year	Hectoliters
1924–25	2,000,000
1925–26	1,553,760
1926–27	1,416,616
1927–28	2,112,207
1928–29	2,171,819
1929–30	3,000,000
1930–31	3,092,892
1931–32	3,314,991
1932–33	4,262,121
1933–34	4,000,000
1934–35	4,800,000

Supply Outstrips Industry's Needs

OF THE estimated total of 4,800,000 hectoliters for 1934–35, an estimate rather under than over the amount which will actually be offered the government, only some 1,100,000 hectoliters will be required for the industries ordinarily employing alcohol in their commerce, such as chemical compounds, vinegar, perfumes, heating and lighting and pharmaceutical products. In order to dispose of the remaining balance of 3,700,000 hectoliters, the Service des Alcools will be obliged in a great measure to rely upon the expedient adopted in 1923 for the creation of an artificial market for its excess stocks.

As far back as the year 1900 the idea had begun to germinate of finding in alcohol a possible substitute for gasoline as a fuel for motor engines. Inasmuch as gasoline was exclusively an article of importation, it was recognized as desirable that France should find in some product of her own soil the means of liberating herself from servitude to countries more favorably placed in this respect. In order to demonstrate the possibilities of alcohol as a carburant, a race was organized from Paris to Rouen and return, a race in which no other fuel was to be employed. Of the forty-eight cars entered, forty finished. To a certain extent the test proved to be encouraging. Unhappily the prohibitive cost of alcohol rendered useless further examination of the question. Later, in 1906, the company operating the autobuses of the City of Paris decided to embark upon a new experiment by confining its buses for the period of a month to the use of a mixture of benzol and alcohol. While the technical results proved to be quite satisfactory, there still remained the insurmountable obstacle of cost. Gasoline could be offered for sale at a price of 30 francs per hectoliter, while the cost of alcohol was exactly ten times that sum.

The government's need, however, of disposing of the constantly growing abundance after the war of its alcohol supply, with the resultant accumulation of stock, induced it to consider the advisability of a resale of what was not needed to the oil industry at a greatly reduced figure. While it was appreciated that a considerable loss must inevitably be sustained, a none the less substantial saving might be realized.

To carry this idea into effect a law was first enacted, that of February 28, 1923, requiring all importers of gasoline, under pain of losing their licenses, to purchase each month from the government's supplies a quantity of denatured ethyl-alcohol equivalent to a minimum of 10 percent, measured by volume, of the amount of gasoline imported during the preceding month as established by the clearings through the customs. Next a formula for a blended gasoline mixture was established and named the "Carburant National." It consisted of a compound of 50 percent U. S. motor gasoline and 50 percent denatured alcohol. It was expected that the so called carburant national would be speedily generalized in all classes of the heavier motor vehicles and that, in

consequence, the relatively unimportant quantity of alcohol thus forced upon the gasoline importer would be readily exhausted.

Government Required Alcohol Blends

EXPERIENCE soon demonstrated, however, that the mixture was altogether unsatisfactory for use except in a very restricted class of motors. It was found that its employment in the great majority of automobiles required fundamental and costly changes in the engine and its accessory parts. The carburant national was therefore abandoned, while in its place was offered a new blend containing a lesser percentage of alcohol and dubbed the "Carburant Poids Lourd." This new mixture was imposed upon the trade by a law enacted July 4, 1931, authorizing the addition of 25 liters of alcohol to every 75 liters of gasoline. This fuel was designed especially for use in such heavy types of motor as the truck, the tractor and the vehicles engaged in the motor transport services. For the lighter cars used principally for pleasure yet another blend was established.

The last carburant was one that had been developed from successive experiments and was aimed to meet the double necessity of finding an outlet for the alcohol withdrawn by the importers and that of providing a gasoline acceptable to the general public which had proven to be extremely rebellious to the use of any fuel other than pure gasoline. It may be remarked here that while the importers were constrained to relieve the government of its excess alcohol, there was no corresponding obligation on the part of the public to purchase the blends offered for sale so long as there was pure gasoline to be had. To be sure, there was a price preferential in favor of the blend, but not one of sufficient importance to stimulate its sale to the point desired.

An order of the Council of Ministers, dated March 22, 1933, permitted the use of a mixture containing 10 percent to 16.67 percent of alcohol. According to a modifying order of July 26 of the same year, the dosage of alcohol was further reduced to a range of 10 percent to 13 percent, where it now stands. The order authorizes it to be designated and sold to the consumer under the name of "Essence (gasoline) Tourisme," the same as that applied to pure gasoline.

Thus there actually exist the following forms of motor carburants for sale by the French retailer:

Carburant Poids Lourd containing 25% alcohol
Essence Tourisme containing 10–13% alcohol
Essence (Pure gasoline)

A table showing the results of five years' usage of these carburants was published recently by L'ARGUS DE L'AUTOMOBILE. The following is an extract pertinent to the matter under discussion.

Consumption of Gasoline and of Alcohol

Years	Gasoline placed on market	Alcohol blended	Total consumption blends	Automobiles circulating
1929.....	22,436,260	221,000	20,413,634	1,296,167
1930.....	25,584,780	350,000	23,376,302	1,520,501
1931.....	28,931,270	551,000	26,589,143	1,689,405
1932.....	30,093,643	855,000	27,939,278	1,712,900
1933.....	32,282,794	1,937,938	30,992,452	1,855,174

Note—The quantities for liquids are stated in hectoliters. The amounts of carburants sold for use in automobiles are 10 percent less than the amounts stated in the second column. This 10 percent principally represents the consumption of aviation.

Oil Companies and Government Both Lose

SOME of the significant features disclosed by this table are referred to below. Meanwhile let it be said that both the government and the oil industry are heavy losers as the result of the policy which has brought about the substitution of artificial carburants for ordinary gasoline. Nor can it be said that the public has found any profit in them. The oil refiners and importers have had their legitimate sales curtailed by the amount of alcohol they have been forced to liquidate. Notwithstanding that the loss of the government on its alcohol purchases has been in a certain measure minimized by the recoveries on its cessions to the refineries and importers, the recuperation thus realized has been absorbed many times over by a reduction of tax receipts. A glance at the detail of the operations involved will aid possibly to a clearer understanding of the situation.

Under the terms of the law of March 31, 1933, the state is committed to the purchase of beet sugar alcohol up to the amount of 2,300,000 hectoliters at a price calculated to equal the value of the sugar from which it is distilled. The price actually paid on this basis is the sum of 276 francs per hectoliter. For all purchases beyond the quantity just mentioned, the rate is fixed at the sum received by the government from the refiner or importer on the alcohol withdrawals effected by them. This amount is either 112 francs or 155 francs per hectoliter, depending on whether the alcohol is used for the carburant Poids Lourd or the Essence Tourisme. Alcohol manufactured from molasses is bought by the government at the rate of 160 francs per hectoliter. The price paid for alcohol derived from grapes or wine is fixed according to a sliding scale varying with the amount offered. It is expected that there will be forthcoming from this source something over 1,400,000 hectoliters on which the average price will be between 325 francs and 350 francs per hectoliter.

Inasmuch as the precise global quantity of alcohol which the government acquired during 1934 is as yet unknown, it is impossible to make an exact calculation of its losses. A fair idea of them may be obtained, however, by restricting ourselves to a calculation based on the 2,000,000 hectoliters of alcohol employed in the manufacture of blended mixtures in 1933 as shown in the table given above.

We must assume that this alcohol came from the distillation of sugar beet products and was bought at the price of 276 francs per hectoliter. If we suppose that one-half was used in the production of the carburant Poids Lourd and one-half in that of the carburant Tourisme, the average price paid the government by the refineries was 142 francs per hectoliter. Here then was an initial loss of 284 million francs. To this must be added the loss on diminished tax returns.

Tax Revenues Reduced

PURE gasoline pays a tax of 156 francs per hectoliter. Alcohol, on the other hand, is subjected to a tax burden when used as a carburant of only 54 francs per hectoliter. By the substitution of the one for the other there results a reduction of 102 francs per hectoliter in the taxes which would normally have been paid by the refiner and importer. This last amount is further increased to 144 francs per hectoliter by reason of certain exonerations allowed gasoline when it is mixed with alcohol. Diminished taxes therefore represents a loss to the state of 288,000,000 francs, a total of 572,000,000 francs. When we consider the excess quantities to be acquired this season, and particularly the costly alcohol derived from wine, the result is sufficient to make even a government pause.

Were there any hope that the output of the distilleries would remain stationary at the amount produced as late, let us say, as the season of 1931–1932, and could still be retained within that limit, the future might be regarded with less anxiety. The steady increase, however, of the

beet sugar industry, with the immense additions of alcohol now derived from other sources, make its contemplation one of unavoidable apprehension. The apprehension grows, if we bear in mind that the consumption of gasoline and gasoline mixtures was reduced in 1934 and will show a further retrograde movement in 1935. The encouraging figures set forth by L'ARGUS DE L'AUTOMOBILE cover a period before the effects of the world crisis had become apparent. They will only begin to become known when the statistics for the two succeeding years have been published. These facts are very discouraging in the face of the tremendous efforts which both the government and the oil industry will be called upon to make this year for the purpose of liquidating the expected increase in alcohol stocks.

The oil industry has been fully alive to the difficulties of the government and the paramount need of the nation for ample provision of all materials necessary for its defense. It has shown itself willing to submit to every measure which might reasonably facilitate the solution of national problems or aid in alleviating the burdens of the state, just as it has been willing to contribute wherever its civic duty may have called upon it to give. Its unprotesting submission to the policy of the law of February 28, 1923, despite the heavy losses entailed thereby as well as its large investments of capital, stand in ample proof of its keen sense of duty. Yet it must be admitted that an element of injustice exists in the extension given this policy which requires an industry, by definition private, to buy in increasing and unlimited amounts an article entirely foreign to its trade, one less efficient and more costly than its own product, and one on which it must suffer an irrecoverable loss. It seems all the more unjust when the industry is made the victim of vices in the laws for which the government is sponsor. If we take the case of molasses, we find that where formerly 70 percent of the production was sold to fatten livestock, only 20 percent is now used for this purpose. And why? Simply because it is more profitable to turn it into alcohol which the government must buy, to be later unloaded on the refiner and importer and, in the last analysis, the public, which must foot the bill.

Accumulating Unmarketable Stocks

WHETHER the market created by the imposition of alcohol blends has already reached the limit of its capacity of absorption or whether it may be yet further extended, it is manifest that the point of saturation is near at hand. If we consult again the table given by L'ARGUS DE L'AUTOMOBILE, we will note, so far as pure gasoline is concerned, no more than a reasonable, normal increase in sales proportionate to the growth in number of the automobiles in circulation. But if we look at the increase in the alcohol used for blends, we find it going up by leaps and bounds. The jump in 1933 is fantastic. There is an increase of 250 percent while that of gasoline, still proportionate to the advance in automobiles, is only 10 percent. Since it is known that the sales for 1934 will be less than the year before—a fact unfortunately true of automobile sales as well—it appears certain that, if the oil industry is called upon to accept still larger quantities of alcohol, the additional amounts will be unmarketable and will remain as a dead loss upon its hands.

There appears to be but one way out of this perplexing clash of interest. The government must fix the maximum amount of its requirements for alcohol, adding thereto as a margin of safety such an amount as the industries of the country, and particularly the oil industry, are capable of employing without unreasonable injury to their commerce, and then limit the output of the distilleries to the quantity so determined. Beyond this point the extension of special favors to the beet grower and wine maker can hardly be justified.

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British Independents Define Their Position

IN A letter from the organization representing independent petrol dealers in Great Britain criticism is made of an article published in November last as giving an inaccurate impression of the attitude of these independents. The writers state that a natural conclusion from the article would be that "the independents in this country are insignificant concerns who are a hindrance to the progress of the major companies and whose extermination by a continuance of price cutting will secure the future of the oil industry."

We think that our independent friends are unduly sensitive. The references in the article criticised were to "casual" or "in-and-out" distributors rather than to well-established independents. As a matter of fact we have advocated editorially an agreement between the combine companies and the responsible independents on a basis of live and let live. In accordance with our policy of publishing bona fide criticism, however, we present herewith the substance of their communication.

CONTRARY to the impression you seem to have gained, the independents in Great Britain are financially sound companies, employing large staffs and conducting substantial businesses on scientific and economical lines.

The combine should have realized by now the utter impossibility of expecting to have the British market entirely to themselves and should recognise that the independents are fully entitled to earn their living in their own country, in a field which they have served a very useful purpose for a number of years. It follows, therefore, that when combine cuts reduce profits to a bare margin the independents naturally strive to increase their turnover in order to maintain their expenses. Further, if the combine succeeded in debarring the independents from profitably marketing gasoline they would inevitably turn their attention to extending the outlets for kerosene, white spirit, fuel oil and lubricating oil and so lower the price structure of the only profitable, section of the combine's business.

The non-combine companies under normal conditions can sell at lower prices than the combine, because they have brought distribution costs to a fine art, and they have not spoiled their customers, as you state the combine companies have done, but give them all and more service than is required of them.

It is untrue to say that they "supply oil of unspecified quality," because today, in nearly every case, the buyer has been educated to know as much about the specification of petroleum products as the supplier. Consequently he demands, and the independents give him, a first class commodity, suitable to his individual

requirements. Furthermore, there are no producers today refining a poor quality product because the saving between good and indifferent gasoline would not only be infinitesimal, but would react against the prestige of the refinery, thereby creating a substantial loss. Therefore, independents cannot distribute poor products since they cannot import them.

The independents are largely the cause of the substantial increase in oil imports annually, and it is due to their healthy competition that the motor industry has been able to make such rapid progress. In 1921 the price of No. 1 combine motor spirit was 3/5½d. per gallon, without tax; today the price of the same motor spirit is 1/5d. per gallon, including 8d. per gallon tax. We venture to suggest that prices would not have been so substantially reduced had it not been for non-combine competition. There is a price, however, below which motor spirit cannot be sold at a profit. It is the combine and not the independents who have taken the lead in reducing below this price; the independents have simply been compelled to follow.

Low running costs have resulted in motor car manufacturers organising their businesses on a progressive basis, and this has built up a large motor spirit consuming public. The haulage contractor has found it possible to meet the competition of the railway companies and has consequently made enormous inroads into goods traffic. Expansion of the motor industry has given employment to hundreds of thousands of workers, and we maintain that the independents have contributed largely towards this achievement.

The test of the esteem in which the independents are held is with the consumer. Through the years of oppression by the major companies the non-combine companies have found their best friends among the largest commercial consumers. These buyers are men of intelligence and foresight, who realise that if the day ever came when the independents were obliged to abandon distribution they would be forced, with no alternative, to take their supplies from the combine. Experience has taught them that combine monopoly means prices that would place their running costs so high as to make them non-competitive. They have substantial reason for believing that the losses which the members of the combine are now suffering on gasoline due to unprofitable marketing, are being debited against them for the future. These "sympathetic buyers" have not and will not forsake the non-combine companies so long as they obtain quality and service, no matter how low a price the combine quote.

Is it not surprising that men of supposed ability controlling the combine companies do not realise that if they became monopolists the government would in all probability step in and control their selling prices, which would permanently defeat their object? They have already seen the result of partial government interference in America.

It should be remembered also that this would bring them into disfavor with the car and transport trade who realise the government's desire to assist the railway traffic returns and certainly do not want government control of a commodity so essential to their business.

So far as we know, and we were concerned in the tentative proposals to the combine, the suggestion of sales cooperation has not been turned down, and it is to be hoped for the sake of the oil industry and all trades connected with it that no such unfavorable peremptory decision will ever be made.

The independents are desirous of working in harmony with the major companies, provided always that their own interests and those of the public are properly and sufficiently safeguarded.

The combine companies distribute 90 percent of the total gasoline sold and consequently control the selling price. The other 10 percent distributed by the independents represents less than the normal annual increased consumption in this country. Is there any logical reason for selling 90 percent of the whole requirements of the second largest motor spirit consuming country in the world at a loss, in order to acquire the remaining 10 percent, which quantity is naturally added to the volume of sales each year by increased consumption, when it has been effectively proved that the independents cannot be exterminated by price cutting, while the simpler remedy can be applied of working in agreement with the independents?

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British Move Against "Hot Oil"

Two aspects of illicit motor spirit distribution have recently been receiving attention in the British press, the first concerning dilution, and the second suggesting dishonesty somewhere in distributing organisations. The dilution case was a prosecution by the Board of Customs against a haulage contractor and a firm of oil importers in which it was alleged that 12,000 gallons of kerosene had been mixed with 150,000 gallons of motor spirit. Although cases of this kind seldom come before the courts, there is a general belief in the distributing industry that the dilution practice is relatively common among a certain class of distributors, both wholesale and retail. In the latest prosecution, the diluted spirit did not carry a well-known brand, but there have been cases when even the products of the national distributing companies have been diluted, either with inferior and cheap petrol or with kerosene, and the evil is thus a source of considerable trouble and annoyance to those importing and distributing organisations who make large annual outlays to maintain the quality of their products. Apart from the vigilance of Customs officials, and the prompt reporting by the honest majority of any irregularity, there is apparently no way of placing a direct check on illegal mixing. By widespread publicity, leading oil companies are doing what they can to educate the public up to the consistent use of high quality branded spirit, sold in a way which reduces the risk of dilution to a minimum, and buyers who are defrauded by receiving an inferior mixture are generally those who sacrifice quality by purchasing the products which happen to be offered at the lowest figure.

Recent reports suggesting dishonest acquisition and sale of motor spirit are to the effect that in certain areas it is being sold from road tank-wagons at inordinately low prices for relatively small quantities. Not only petrol stations and garages, but commercial users of motor spirit are said to have received offers of spirit for immediate delivery at prices far below even the 8d. per gallon petrol tax. As the tax has apparently been paid on the spirit, such offers obviously point to the illegal acquisition of the spirit by the seller, and it has been suggested that the checks imposed on tank-wagon drivers by distributing companies require tightening up, or that the retailers receiving motor spirit from tank-wagons have an insufficient check on the quantities delivered to them. Unless efficient checking is maintained, it is naturally not difficult for a dishonest tank-wagon driver to overstock himself when withdrawing spirit from the depot, and by a system of short deliveries, leave himself with an appreciable balance in his tank at the end of his round.

Irish Free State Encourages Home Refining

Fiscal Preference Expected to Lead to Domestic Manufacture of Country's Motor Spirit Supply—Cork Harbour Refinery Under Construction.

LATEST convert to the theory that national interest will be promoted by the development of a domestic refining industry is the Irish Free State which has now adopted a policy of preference for home-produced motor spirit. A resolution recently adopted by the Free State Parliament provides that, with certain exceptions, an excise of 6d. per gallon shall be paid by manufacturers of hydrocarbon oil made in the Irish Free State after February 1. The import duty on motor spirit is 8d. per gallon. Thus a preference of 2d. is extended as an inducement to refining within the country.

Introducing the resolution, the Free State Minister of Industry and Commerce discussed the refinery which is now being erected at Haulbowline Island by Cork Harbour Oil Wharves Limited to take advantage of the preferential. The company has operated an ocean oil installation at Haulbowline for some years, and under the promise of a preference of 2d. per gallon on motor spirit, it has developed plans for refining. Two important British concerns, Lobitos Oilfields Limited and its affiliated company, Anglo-Ecuadorian Oilfields Limited, have taken a financial interest in the Cork Harbour Company. The Anglo-Ecuadorian chairman told shareholders at the annual meeting in December that the Cork Harbour holding, in addition to yielding the participants a profit on refining, would provide them with a new outlet for part of their crude production. Output of the new refinery, when constructed, is expected to be about 3,000,000 gallons of motor spirit per annum, but the Free State authorities hope that this will be only a prelude to a much larger development. They look forward to the ultimate establishment of a refinery in the Dublin district with an annual capacity of 20,000,000 gallons, and smaller plants in other areas sufficient to bring the aggregate output up to 35,000,000 gallons per annum, which would approximately meet the prospective consumption of motor spirit in the Irish Free State.

Spirit benefiting from the 2d. per gallon preference will be sold to the public at slightly less than imported spirit, but it is admitted officially that if all the requirements of the country are filled from home production it will be necessary to increase the excise duty to 8d. per gallon owing to the revenue requirements of the Government. In such case, however, the preference of 2d. over imported spirit will be maintained by increasing the import duty.

Difficulties already are foreseen in successfully operating this scheme for providing the country with its own motor fuel. There is an extremely limited market in Southern Ireland for the by-products of a motor-spirit refinery, and one of the problems to be faced is the disposal of materials of this kind. The development of an export market by a country like the Free State, which is not normally a seller of petroleum products, would be a difficult matter under current conditions. From the standpoint of the companies already distributing motor spirit in Ireland, the new development of Irish fiscal policy requires careful consideration. The market is not extensive, and is barely remunerative at present, but it holds possibilities of development which make it worth keeping. Although the latest development of "economic nationalism" in the Free State carries superficial advantages, it is doubtful whether a market of such small dimensions lends itself to successful home production. The preference on home produced motor spirit is interpreted in some quarters as another move on the part of the authorities to weaken the country's economic ties with Britain. If this is the aim, it is not being pursued very effectively, for American oil concerns, including Texas Corporation, through Texas Company (of Ireland), and Standard of New Jersey, through the Irish American Oil Company, are among the non-Irish importing interests likely to be adversely affected. Conversely, the only known outside interest in the prospective home production scheme is the shareholding in the Cork Harbour Company by Lobitos and Anglo-Ecuadorian, both companies domiciled in England.

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Proposed Italian Refinery

AMONG the new companies formed in Italy and interested in the proposed refinery construction programme, may be mentioned the CISPADANA (Societa per l'Industria Chimica Minereria Anon. Italiano), Milan. The company has a capital of 30,000,000 lire, and at a recent shareholder's meeting it was proposed to increase the capital to 160,000,000 lire at a later date.

CISPADANA is reported to have government support, and holds important drilling concessions in Albania in conjunction with the A.I.P.A. Applications have been made for concessions to build two refineries—one of 700,000 bbl. per year, and both will be Bossich cracking units. It is understood that the Cantieri Monfalcone has been requested to quote on the erection of one of these plants. It is planned to refine and crack Albanian crude.

The organisation is headed by Dr. Federico Plate, chemical professor of the University of Rome, and who was the technical promoter of the S.I.P.O.M. refinery at Naples. The technical manager, Herr Bender, was formerly connected with the Bossich Company in Germany and was associated with the development of the Bossich cracking process.

The following are the principal officers of CISPADANA, which was formed on the 4th of August, 1933: Dr. Federico Plate, President and Managing Director, Carlo Agnoletto, Director, Engineer Giuseppe Minari, Director. College of Syndics consists of Guido Capella, Dr. Carlo Corsi, Pietro Bettenini, Inigi Bazzi, Carlo Biscia, and Herr Bender, Technical Manager.

The address of the head office is Via E. De Amicis 47, Milan, Italy.

World Petroleum Abstracts

Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing With Technical and Economic Aspects of the Industry.

By Dr. O. W. Wilcox

Petroleum Geology

GEOLOGY OF SANTA BARBARA MESA FIELD.—E. Baden Powell in PETROLEUM WORLD, vol. 31 (1934), No. 11, pp. 22, 24; 28–30; 44.

The Santa Barbara Mesa has lately become the scene of active prospecting, due to a 2000-bbl. strike. As the author describes the circumstances and geology of the field, the situation is likely to become typical of an overdeveloped town-lot field. There is abundance of geological and field evidence that a sufficient amount of petroleum can be recovered from this field at present market prices for the type of oil produced here.

The drilling is shallow and costs of development low, but the field is likely to prove a disappointment unless the number of wells is limited and spaced within the productive limits of the structure. In the author's opinion there should be one well to not more than five acres, but in view of the large number of wells being drilled and in prospect in the town lot section, it is likely that some operators will suffer considerable financial loss.

A NEW METHOD OF IDENTIFYING WELL CORINGS.—A. Kumm, in PUMPEN U. BRUNNENBAU, vol. 30 (1934), No. 24, pp. 724–727.

Besides the two main methods of ascertaining the geological age of well corings—the petrographic and the paleontologic—there is a third which depends on outward appearance (which might be called the phaneomic). One of the most obvious properties of a substance or object is its color, and although the color of a material might be subject to modification at any time in the history of the object it has a certain diagnostic value in geology.

To be of any value a color scale must be referable to a fixed and reproducible base. Such a standard scale is afforded by the Pulfrich photometer (Carl Zeiss) which is essentially a mono-ocular double telescope. For examination by this instrument the core material (clay, sand, chalk, etc.) is enclosed in a thin layer between two glass plates. The sample so prepared is placed before one objective of the photometer and a standard barytes plate is placed before the other objective; the shutter of the instrument is then adjusted so that both objectives show equal illumination; the micrometer scale of the shutter then indicates the color value of the sample in percent.

The practical value of this method resides in the fact that if samples are collected from a few wells in an oil field showing the color gradations of the different formations penetrated, similar samples from new wells can be more or less accurately correlated, especially if supplemented by dependable paleontologic and petrographic data.

MOUNTAINS OF SALT.—Paul D. Foote and L. I. Nettleton, in TECH. ENGINEERING NEWS, vol. 15 (1934), No. 25, pp. 86–88.

In this interesting paper an attempt is made to explain the formation of salt domes. These phenomena are abundant on the Gulf Coast west of the Mississippi river. In this zone, 100 miles wide and 400 miles long, if the surrounding formations were removed there would be revealed at least 150 gigantic mountains of salt from one to several miles in diameter and in some cases rising 20,000 feet high, with smooth, precipitous sides, sometimes expanding at the top like a mushroom. The origin of these objects appears to be as follows: in an ancient sea a deposit of salt 500 to 1,000 feet thick was formed and later covered by thick sediments. Under the pressure of this overlying material the salt began to behave as a liquid of extremely high viscosity, and being of lighter density than the overlying rock was gradually forced up through fissures, very much like an intrusion of fused volcanic rock. Distortion of the surrounding sediments forms large traps in sand and limestone that permit the accumulation of oil. These salt intrusions are not observable at the surface, which is a flat coastal plain, but are clearly revealed by the well known methods of gravity survey.

HEAVY MINERAL CORRELATION STUDIES.—M. N. Bramlette, in BULL. AM. ASSOC. PETROL. GEOLOGISTS, vol. 18 (1934), No. 12, pp. 1559–1576.

Where the macro- and micro-faunas of the subsurface geology are meager the geologist is forced to rely on lithologic data. One method coming under this head is the identification of zones by their content of characteristic minerals. When the mineral percentages of a section have been determined from core samples of a few wells similar zones in other wells of the district may be more or less conclusively identified. This paper shows how the method has been applied to the correlation of sands at Kettleman Hills.

Oil Well Operation

ENGINEERING STUDIES AND RESULTS OF ACID TREATMENT OF OIL WELLS.—R. E. Heithecker, in REPORT OF INVESTIGATIONS, No. 3251 (Oct. 1934), U. S. Bureau of Mines.

This is an account of investigations in the Zwolle oil field of Sabine Parish, La. where the oil is obtained from marl and chalk-rock formations, the oil being localized in vertical or nearly vertical solution cavities or in porous zones of limited horizontal extent. Oil-producing horizons may occur anywhere in the 500-ft. thickness of this marl and chalk series and the percentage of dry holes is large. At the request of operators the Bureau of Mines undertook a study of acid treatment in this field, with interesting results. This method was found to offer favorable possibilities for reviving oil production, especially in unprofitable pumping wells, and as a "last chance" in testing "oil showings" in newly drilled wells. At least a dozen wells in the Zwolle field have been equipped for pumping and placed upon production following the acid treatment that otherwise probably would have been abandoned as noncommercial wells. The additional cost of treating a newly drilled well, if war-

ranted by oil showings, does not add materially to the total cost. To January 1, 1934, 623 wells were drilled in the Zwolle area; of this number 361 or 58 percent were dry holes. Oil showings were recorded in many of these dry holes, some of which might have been treated successfully by acid solution.

Although the percentage of oil-well completions in the Zwolle field has remained low since the introduction of acid treatment in December 1932, the ratio of the number of oil wells completed to the total number of tests drilled has increased from 39.5 percent for the 13-month period before December 1, 1932 to 47.6 percent for the 13-month period after December 1, 1932.

It is possible that the lack of success in some examples of treatment may have resulted from insufficient amount of acid to dissolve the "limy" deposit on the liner, which in some instances has ranged from one-fourth to three-eighths inch in thickness. It may be advisable to condition wells which are making water for a period of time before treating by pulling the liner and cleaning out the calcareous deposition and sludge material that may have collected in the bottom of the hole before acid treatment, so that the chemical action of the acid will become more effective in opening new drainage channels or establishing better flow conditions in the old channels after this conditioning.

At least 150 wells were given 190 acid treatments during the 13 months ended January 1, 1934 at a cost of about $50,000 to the operators. Based on an estimated production of 604,000 barrels of oil due to acid treatment, the return was approximately 12 barrels of oil per dollar expended. During this period the range of the posted price of crude oil was from $0.25 to $1.01 per barrel; and the average, weighted on a daily basis, was $0.66.

Stage Lifting Applied to Gas Lift Operations.—Floyd Swindell, in OIL WEEKLY, vol. 76 (1934) No. 1, pp. 19–20.

When the gas pressure required to lift oil to the surface of the well exceeds the formation pressure, fluid movement into the bottom of the hole is retarded and gas-lift becomes uneconomical. A stage-lifting device has been tried out in the Oklahoma City field, where producing depths are around 6,500 feet, that allows of gas lifting at lower pressures, whereby the flowing life of wells is prolonged. The performance of the device is indicated by the results of one installation in a 6,480 ft. well where the formation pressure was 300 lbs. and production 300 bbl. a day, using 3,000 to 3,500 cu. ft. of gas per bbl. After installation of the stage-lift device production increased to 600 bbl. and input gas decreased to 1,500 cu. ft. per bbl. Another well, which had declined to zero production on gas lift, produced 291 bbl. a day for 236 days while all surrounding wells were on the pump.

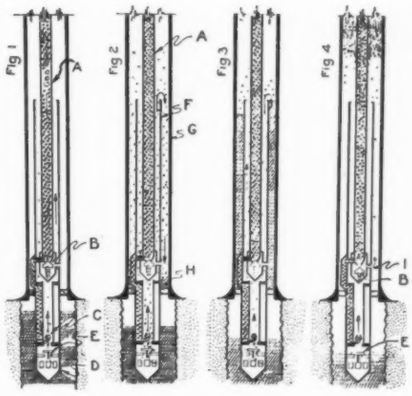


Figure I

The operation of the device is illustrated in the accompanying chart. Fig. 1 shows gas being admitted to tubing A at relatively low pressure. The spring-loaded valve B is closed, diverting gas to nozzle C. In Fig. 2, gas and oil from the formation enter perforated anchor D and valve E and together with gas from C enter the space between casing G and reservoir pipe F, which in this case is 600 ft. long. Packer H prevents back drainage. In Fig. 3 the reservoir is nearly full of oil. When sufficient submergence has been attained valve B opens (Fig. 4), admitting high pressure gas through I, valve E closes and the oil accumulated in the reservoir (about 15 or 20 bbl.) is lifted in a slug to the surface.

Handling Crude Oil Emulsions between Well and Electric Dehydrator.—William Woelflin, in PETROLEUM ENGINEER, vol. 6 (1934), No. 1, pp. 57–58.

How crude oil emulsions are handled between well and electrical dehydrator has a great deal to do with success in the dehydration process; the plant engineer must be on the lookout to obviate circumstances that may cause the emulsions to go from bad to worse. One of the chief ways of making an emulsion worse is to expose it to repeated agitation. To avoid agitation as much as possible the pump used should be of the positive displacement type, with a minimum of slip, and it should fill completely at each stroke; the suction line must be of the same diameter as the pump suction, or larger; pipelines should be as short and as straight as possible and contain the fewest possible fittings that would cause swirling.

As much water as possible is removed by settling in a tank connected ahead of the dehydrator. Many wet oils, especially in California, require heating immediately before dehydrating. If the heating is done in the "wet tank" by steam coils in the oil layer, these coils should on no account be allowed to develop leaks that would allow steam to bubble through the oil and aggravate the emulsified condition. It has been found in practice that heating wet oil for a long time makes it more difficult to dehydrate, and hence the use of heat in large wet tanks should be avoided wherever possible. Instead, and if circumstances permit, the oil may be delivered to the dehydrator through a section of pipe with a steam jacket. Heating wet oil to reduce the viscosity so that it can be pumped, allowing it to cool and reheating for dehydrating is a very bad practice, and should be done only when absolutely necessary. Pick-up or "dead oil" such as sump skimmings, tank bottoms, or oil containing mud should by all means be kept out of fresh oil.

Straight-Hole Technique in Trinidad and Its Effect on Well Spacing.—H. C. B. Hickling, in JOUR. INST. PETROLEUM TECHNOLOGISTS, vol. 20 (1934), No. 132, pp. 936–950.

Oil field engineers are now giving much attention to the verticality of oil wells, for beneficial reasons that are becoming more and more evident. There are a number of factors that affect verticality of wells drilled by the rotary, but the author selects one that exceeds all others in importance, especially under conditions now obtaining in Trinidad where regulations postulate 300 ft. spacing, so that if the field is to be drained effectively the drainage foci must be placed at the right points. Well spacing and profits vary with the drilling error; a departure exceeding 50 ft. in wells of normal depth will leave large undrained areas in the pool if 300 ft. spacing is imposed.

The greatest enemy to verticality, which the author selects for special attack, is fast drilling (as regards footage) with excessive weight on the bit. Fast drilling in a field where wells cannot be placed within 150 ft. of a boundary has no excuse, because town-lot scrambles for the cream of the pool are eliminated. It is in general foolish to attempt to reduce drilling costs by mad bursts of speed. As the author sees it, only 10 percent of the driller's time is spent on drilling, the

remainder being spent on moving, rigging, running in and out, etc., and direct drilling charges, or money spent on ordinary operations plus derrick cost are only 40 percent of drilling charges when all field costs are allocated to feet drilled or barrels produced. One extra fishing job may offset the speed advantage.

The one consistent friend of the driller who aims at verticality is gravity, which should be given every chance to function. The weight on the bit should be concentrated close to the cutting edge, so that the point where the drill pipe or stem passes from a state of tension to one of compression shall be as low as possible. Below this neutral point the stem should be rigid, but above as flexible and as small as consistent with the load to be supported. When bits and drill collars are light the neutral point will tend to lie high in the drill pipe, which, being comparatively flexible, is likely to bend to one side and start a deviation, but the horizontal component tending to bring the bit back to the vertical is strengthened if the weight is concentrated as close as possible to the cutting edge. Various other practical means of controlling verticality are indicated.

Natural Gas

Accuracy of Pitot-tube Measurements. Edward M. Rauh, in PETROLEUM ENGINEER, vol. 6 (1934), No. 11, pp. 66–70.

Pitot tubes are commonly used in measuring the velocity of gas in a pipe line. As is well known, angles and bends in the line produce turbulent flow that in general reduces the velocity and hence the capacity of the line. The author of this paper gives some useful hints on the use of the pitot tube for taking account of such disturbances.

Styrene and Indene from Persian Natural Gas.—S. F. Birch and E. N. Hague, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 26 (1934), No. 9, pp. 1008–1010.

Certain natural gases, such as those of the Persian oil fields, yield notable quantities of styrene and indene when heated in tubes to 850 deg.–1,000 deg. C. The main product is a "crude benzene" suitable for motor use. A plant capable of dealing with five million cubic feet of this gas will produce about 15,600 U. S. gal. of motor benzene which will contain about 900 gals. of styrene and about 360 gal. of indene. These last are possible sources of organic compounds of potential industrial value.

Petroleum Refining

Safety Vent for Fractionator Outlet in Gasoline Plant.—J. C. Albright in PETROLEUM ENGINEER, vol. 6 (1934), No. 11, p. 58.

A disastrous fire involving several lives and much property loss occurred in a gasoline plant, the cause being traced, presumably, to the sticking of a reduction valve on the stabilizer outlet line as a result of too tightly screwing up the packing gland. To obviate similar disasters in the future an apparatus has been placed on the stabilizer line carrying the finished gasoline that will prevent a sudden increase in pressure on the storage tanks should there be a failure of control in the plant. This arrangement consists mainly in placing between the reduction valve and the storage tank distribution header a balancing tank that serves as a receptacle for the gasoline as it is released from the reduction valve, and as a gas separator and excess pressure release on the transfer line and storage tanks. The safety valve on top of the separator is tested every day to assure that it has not become frozen to its seat.

Entrainment in a Bubble-Cap Distillation Column.—George E. Holbrook and Edwin M. Baker, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 26 (1934), No. 10, pp. 1063–1067.

As a result of experimental work on a specially constructed column at the University of Michigan the authors arrive at the following conclusions:

Plate spacing and column vapor velocity are about equally important in determining the amount of entrainment under any given conditions. In general, doubling the column vapor velocity results in approximately a tenfold increase in entrainment. Furthermore, the closer the plates are, the greater is the effect of the column vapor velocity. As an approximate generalization, cutting the plate spacing in half results in about a tenfold increase in entrainment.

The amount of reflux has only a moderate effect on entrainment. Increasing the reflux from 100 to 300 lbs. per hour results in approximately a twofold increase in entrainment. Entrainment is not very sensitive to changes in slot vapor velocity, other things being equal. Its effect is about the same order of magnitude as that of the amount of reflux. Under certain conditions, increasing the slot velocity 2.41 times only doubles the entrainment; under other conditions this same increase in velocity actually decreases the amount of entrainment.

Surface tension of the liquid affects the amount of entrainment, as would be expected from theoretical conditions. Compared to the other variables, it does not appear so important. A generalized correlation between surface tension and entrainment is as yet impractical.

Nickel Steel for Low Temperature Dewaxing Processes.—R. K. Hopkins in NATL. PETROL. NEWS, vol. 26 (1934), No. 49, pp. 21–30.

A 4 x 8 pressure vessel with walls 1½ inches thick of 2¼ percent nickel steel for use in low temperature processes in a refinery has been satisfactorily fabricated and subjected to rigid acceptance tests, thus demonstrating the possibility of using this alloy in the oil industry; 2 percent manganese steel is not satisfactory for low temperature work.

Lubricated Plug Valves in Refinery Service.—G. F. Scherer, in PETROLEUM ENGINEER, vol. 6 (1934), No. 11, pp. 73–76.

The lubricated valve has introduced an entirely new principle in the control of fluid flow in pipelines; leakage through the line or the stuffing box is something that is no longer inevitable and simply an affliction to which all valves are subject. In non-lubricated valves closure is dependent on the closeness of fit of the metal surfaces; in the lubricated valve fit of the surfaces is still important but closure becomes more certain if the capillary space is sealed by the lubricant against entry of the line fluid, especially when corrosion and/or erosion have impaired the original carefully machined surface. In the modern plug cock, corrosion is further obviated by a construction such that when in the open position there are no surfaces in the direct line of flow, and by an arrangement for using the lubricant on the principle of a hydraulic jack there need be no stuck valves. The lubricated plug cock is quick-acting, and can now be had in sizes up to 30 in.

Plug valves are of particular value in the handling of all chemicals and hot acid sludges encountered in refinery practice. They are also now found on equip-

ment for pumping naphthas and other distillates. One of the largest fields for lubricated plug cocks is in connection with vapor recovery systems, and in casing-head gasoline plants where prevention of leakage is of the highest importance. Other important fields for lubricated plug cocks are the dewaxing plants and the loading racks. These valves are practically mandatory in the selective solvent processes of refining where high pressure and corrosive materials are involved. They are not generally employed on cracking equipment at temperatures above 500 deg. F.

The lubrication of plug valves is a field in itself, as much depends on the choice of lubricant; manufacturers of these valves are able to advise on this point.

Propane Dewaxing.—Robert C. Conine, in OIL & GAS JOUR., vol. 33 (1934), No. 31, pp. 17–33.

A process is described in which a typical Pennsylvania long residium is diluted with propane, which is allowed to evaporate until the temperature reaches −40° F., the wax being removed continually on a rotary type filter. Unusually low pour points of the recovered lube oil are obtained. Asphaltic material is removed at the same time. Filtering costs are greatly reduced. The lube oils can be fractionated according to viscosities, and a better balance between neutral and bright stock secured. A comparison is given of costs under the old and the propane methods.

Vapor-phase Clay Treatment of Cracked Gasoline.—H. M. Steininger in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 26 (1934), No. 10, pp. 1039–1044.

The process most widely used, other than acid treatment, for the chemical purification of cracked distillate is the vapor-phase treatment with clay, originated by the late T. T. Gray. At the present time little quantitative data is known relating to the properties of the pressure distillate heated in this manner and the present article presents such data obtained from several experimental installations. The following data are from two sources representing two radically different rates of treatment expressed as contact time but at practically the same barrelage per hour per ton of clay. The A data given below were taken on distillate derived from cracking reduced Pine Island crude (60 percent) in a Cross unit and treating the distillate in the vapor phase with clay in a 15-ton, single clay tower, operating at 45 lbs. per sq. in. pressure, followed by after-fractionation in a seven-tray bubble tower prior to condensation. The B data were taken on distillate derived from cracking 28 deg. to 30 deg. A.P.I. Midcontinent gas oil in a Holmes-Manley unit operating under conditions of low liquid level, and from treating a portion of the distillate from the cracking unit in the vapor phase with clay in a 100-lb. experimental clay tower, the clay treatment being carried out at full still pressure of 350 lbs. per sq. in. The treated vapors were passed through a small eight-tray bubble tower after contacting with the clay.

The character of the material undergoing clay treatment and also that of the treated stock are illustrated by the following typical data:

Data	A	B
Type of cracking unit	Cross	Holmes-Manley, low liquid level
Pressure, lb. gauge	700	350
Stock charged	Reduced crude	Midcontinent gas oil
Transfer line temp., deg. F	875	900
Treating rate, bbl./hr./ton	6.4	6.3
Contact time, sec.	23	150
Temp. in clay bed, deg. F.	415	494

Data	A		B	
	Feed to clay tower	Clay-treated stock	Feed to clay tower	Clay-treated stock
Sp. gr. at 60 deg. F.	0.7616	0.7443	0.7531	0.7245
Gravity, deg. A.P.I.	54.3	58.6	56.4	63.8
A. S. T. M. 100-cc. distn., deg. F.:				
Initial B. P.	98	90	88	86
Percent distilled over:				
20	176	158	182	150
50	330	282	272	220
90	410	386	392	342
End point	425	400	440	396
Sulfur, percent	0.055	0.040	0.070	0.055
Color (Saybolt)	12	30	5	30

These data show that high yields from clay can be obtained when using initial color as a criterion. Yields of 5,000 to 6,000 bbl. of stock of acceptable color stability per ton of clay can be obtained when treating distillates of the type used in this work and under the conditions employed. Higher pressures and temperatures with increased contact time seem, on the basis of the data presented, to result in improved color stability properties of the product.

The oxidation stability is materially affected by clay treating, and a definite relation exists between yield from clay and the oxidation characteristics of the treated product. The induction period is favorably affected up to a yield of 4,000 to 5,000 bbl. per ton of clay.

Since initial color can be obtained up to high yields from clay, at which yield the color stability may not be of as high an order as desirable, the use of butyl or amyl amines offers a means of securing improvement in color stability even at high yields from clay. The clay treated stocks respond very well to the use of oxidation inhibitors.

Isolation of a Natural Inhibitor from Roumanian Cracked Distillate.—F. Sager in JOUR. INST. PETROLEUM TECHNOLOGISTS, vol. 20 (1934), No. 11, pp. 1044–1050.

In refining experiments on cracked distillates with soda wash previous to acid treatment a phenolic inhibitor was isolated by precipitation with carbon dioxide; it consists chiefly of p-cresol. The presence of this natural inhibitor is found to have a considerable effect on the Voorhees and Eisinger gum test when applied to a Roumanian Dubbs-cracked distillate; hence consecutive soda washing causes a reduction of the gum stability of the gasoline. This natural inhibitor may be recovered and returned to the distillate after the final sweetening; in quantities from 0.01 to 0.05 percent it stabilizes the distillate to give not more than 10 mg. of gum by the Voorhees and Eisinger test and less than 1 mg. by the copper dish test. By limiting the attack of sulphuric acid to the most unstable hydrocarbons, i.e., with a reaction time as low as 5 seconds, there is sufficient prestabilization to allow successful application of the described inhibitor.

Emulsions Treated at Low Cost.—J. W. Smith, in PETROLEUM ENGINEER, vol. 6 (1934), No. 3, pp. 29–30.

In the construction of an emulsion-treating plant by the Berry Asphalt Company at Waterloo, Ark., use was made of three cast-iron sectional gas-fired

units assembled in the manner of a steam radiator; hence the term "Oil-Rator." In operation the raw oil, carrying 10 to 15 percent emulsion water, is sent through a heat exchanger to the first 10-section unit where it is heated to 210–220° F. and then to two gun barrel tanks where 60 percent of the water settles out. The oil is then pumped to two 7-section Oil-Rators connected in parallel where it is heated to about 240° F., and then to a 50-bbl. tank where the remaining water flashes off as steam. A test run of two weeks on 1,600 bbl. daily showed a cost of 1.2 cents per bbl. for chemical and 1.1 cents for fuel; total 2.3 cents per bbl. That this is exceptionally low-cost treatment is indicated by the fact that the cost in a nearby plant is 8 to 12 cents per bbl. The final water content is less than one percent. There is no extra labor cost and depreciation is very low.

Petroleum Physics

Viscosity and Molecular Weights of Hydrocarbon Oils.—M. R. Fenske, W. B. McCluer and M. R. Cannon, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 26 (1934), No. 9, pp. 976–980.

In view of the importance of viscosity index in the specifications of lubricating oils, all new information bearing on this property becomes of interest. The average molecular weights of complex high-boiling hydrocarbon mixtures have been obtained by the authors by a method based on heats of vaporization. This permits an independent check on the cryoscopic method of molecular weight determinations. Using six different oils, the greatest difference between the two methods was found to be seven percent. The average molecular weights of fourteen different hydrocarbon oil fractions have been determined satisfactorily by the method involving heats of vaporization. These data have been correlated on the basis of viscosity index and 37.8 deg. C. (100 deg. F.) Saybolt viscosity by the following equation:

$$\text{Mol. wt.} = 240 + \frac{32,310 \log_{10} \frac{100^\circ \text{ F. viscosity}}{28.0}}{305 - \text{viscosity index}}$$

Conversion of Kinematic Viscosity to Universal Saybolt Seconds.—W. B. McCluer and M. R. Fenske, in IND. ENG. CHEM., vol. 27 (1935), No. 1, pp. 82–86.

The conventional method of determining the viscosity of petroleum products in this country is by means of the Universal Saybolt viscometer. The Saybolt viscometer is considered satisfactory for plant control work and for determining the specifications of commercial petroleum products. On the other hand, this viscometer is not sufficiently accurate for many purposes and requires inconveniently large amounts of material for its use in research work. Also, the resultant unit of viscosity, known as the Saybolt second, is entirely arbitrary and as such cannot be used in engineering design and physical measurements.

Other types of viscometers are preferred for accurate viscosity measurements and for use in research work where the quantity of processed material must be kept relatively small. The results obtained by these improved viscometers are expressed in fundamental units. These units are satisfactory to the designing engineer but have no practical significance to those accustomed to express viscosity in Saybolt seconds. Hence, there is a demand for accurate interconversion data in these units of viscosity both on the part of the design engineers and on the part of the technologists of the petroleum industry.

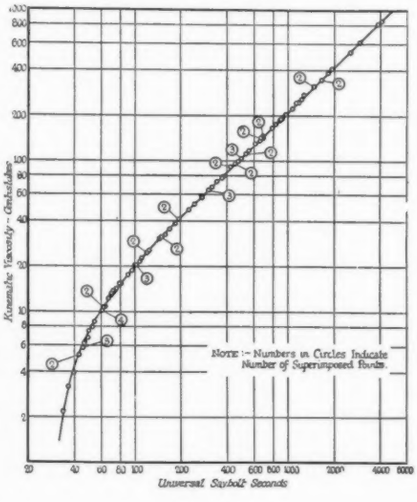

Kinematic Viscosity - Centistokes
Universal Saybolt Seconds
Note :- Numbers in Circles Indicate Number of Superimposed Points

Figure II

Equations have been proposed at various times for converting fundamental units of viscosity to Saybolt seconds. But the authors find that the accurate new data which they have obtained cannot be expressed by a single simple equation, and they prefer to present their results in the annexed diagram, in which the data are represented logarithmically. Abscissas are Universal Saybolt seconds and ordinates kinematic viscosities in centistokes. The same conversion can be used for viscosities at either 37.78° (100° F.) or 98.89° C. (210° F.).

Petroleum Chemistry

Analysis of Gaseous Hydrocarbons.—Hans Tropsch and W. J. Mattox, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 6 (1934), No. 6, pp. 404–408.

The method described here is dependent upon the fractional solution of propene and butene in 87 percent sulfuric acid, the density of the mixture of propene and butene serving to give the index, or ratio, of the two olefins. The accuracy of the method has been verified by the analysis of carefully prepared synthetic mixtures of known composition. Application to the analysis of refinery gases has shown the method suitable for rapid, routine analyses.

A low-temperature fractional condensation method for determining the gasoline content of gases has also been developed and its application to the analysis of a wide variety of refinery gases has shown it to be suitable for the rapid, accurate, routine analysis of these gases. The refinery chemist is thus enabled to sharpen his control of these materials.

The apparatus for these determinations is described in detail.

Specific Refractive Dispersion of Hydrocarbons.—A. L. Ward and W. H. Fulweiler, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 6 (1934), No. 6, pp. 396–400.

The experience of the authors is that a combination of physical and chemical methods is more satisfactory in the analysis of hydrocarbon mixtures than either type of method alone, and among physical methods they have found specific refractive dispersion of value. It is difficult to separate closely related hydrocarbons, but by knowing the characteristics of the pure compounds it is possible to determine what type of hydrocarbon is under examination. The authors give these constants, some of which they have determined, and indicate how the method may be used to reach decisions in doubtful cases.

Indiana Oxidation Test for Motor Oils.—J. H. Rogers and B. H. Shoemaker, in INDUSTRIAL AND ENGINEERING CHEMISTRY, vol. 6 (1934), No. 6, pp. 419–420.

Oxidation stability of motor oils, especially in heavy-duty service, is an important characteristic. The authors have found that a test using air at 341 deg. F. (171.7 deg. C.) gives the best correlation

with engine performance tests, and their method in standardized form here described is used by various laboratories of the Standard Oil Company of Indiana.

Upon oxidizing motor oils at relatively high temperatures it is generally found that no insoluble oxidation products form during an initial period, after which asphaltene formation takes place at an increasing rate, this behavior often being known as sludging. The Indiana oxidation test measures the length of time (sludging time) until rapid formation of asphaltenes begins, as indicated by an asphaltene content of 10 mg. per 10 grams of oil. In addition, as a measure of the rate of sludging, the time required to form a larger amount of sludge (100 mg. per 10 grams) is also determined. Motor oils vary widely in their oxidation stability—from 10 or 15 up to several hundred hours' sludging time—those of lighter grades having, in general, lower stabilities than the heavier grades. For oils of certain types which have little or no tendency to form asphaltenes, it becomes more desirable to measure the rate of viscosity increase for which the test procedure makes provision. In general, on the basis of work previously described, for oils having a sludging time above about 100 hours, determination of the viscosity increase becomes more significant than sludging time and a sludging rate.

Oxidation of Cracked Oils.—E. Vellinger and G. Radulesco, in REV. PETROLIFIERE, No. 606 (1934), p. 1439.

The authors have worked out a method for studying the keeping quality of gasoline, using light as the oxidation catalyst. Two sources of light were utilized, the quartz-mercury lamp and ordinary electric lamps. Changes in the reacting system were measured in two ways: by a constant volume apparatus connected with a mercury manometer, or by a constant pressure apparatus connected to a mariotte flask, the amount of water displaced being taken as a measure of oxygen absorbed. This method dispenses with the more troublesome and expensive bomb method.

The results indicate the presence in cracked gasoline of two groups of constituents that have quite different absorbing capacities; in one of these groups the absorption of oxygen is slow but regular; in the other it is at first very slow and then extremely rapid. Oxidation proceeds in the dark, but at a much slower rate than in the light. It is definitely established that the presence of oxygen is necessary for the formation of gum. There is a linear relation between the volume of oxygen absorbed and the quantity of gum formed, and this relation is the same in the dark as in the light. The ratio of gum formed to oxygen absorbed is not the same for all gasolines; the more thorough the refining the smaller the gum/oxygen ratio. There is also a relation between the molecular weights of the oxidizable constituents, the gum/oxygen ratio being the greater the higher the molecular weight.

The authors were able to effect oxidation without formation of gum by using a bichromate solution; the samples so obtained were much superior to those refined by means of sulphuric acid.

Analyses of Louisiana Crude Oils.—A. J. Kramer and E. L. Garton, in REPORT OF INVESTIGATIONS, No. 3253, U. S. Bureau of Mines (Nov. 1934).

Analyses are given of 26 representative crude oils from various formations in southern Louisiana. Of the 26 oils 8 are of napthene base and 16 containing no wax. The stratigraphic position of the producing bed has a decided influence on the characteristics of these oils.

Improved Form of Sulphur Determination Apparatus.—Fred Esling in JOUR. INST. PETROLEUM TECHNOLOGISTS, vol. 20 (1920), No. 11, pp. 1051–1053.

The new apparatus for determination of sulphur in oils devised by the author possesses a number of advantages. As

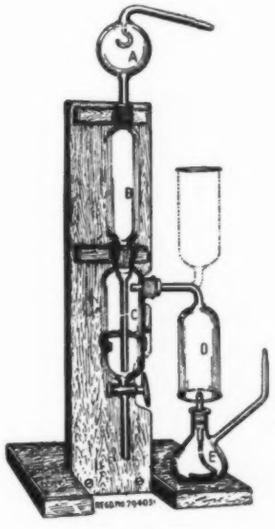


Figure III

shown in the diagram, A is a safety bulb, B an absorption bulb filled with glass balls, C a slightly larger bulb with a stopcock at the bottom and a side opening into which fits the bent outlet of the hood D, under which the lamp containing the oil is placed. In operation the balls in B are wet with a measured quantity of standard N/16 sodium carbonate solution, the excess dripping into C. Fumes from the lamp are drawn as usual through the apparatus by suction applied to A. After the test, the apparatus is drained through the stopcock at the bottom of C; the hood D is inverted and filled with water, which is drawn into the apparatus by the suction pump; this washing operation is repeated two or three times without dismantling the apparatus and the combined liquid is titrated with N/16 sulphuric acid.

Factors Affecting the Formation of Gum in Gasoline.—I. L. McNamara, in REFINER AND NAT. GAS MFR., vol. 13 (1934), No. 10, pp. 381–385.

The primary cause of gum formation in gasolines is the presence of air; no gumming occurs if the gasoline is stored so that it does not come into contact with oxygen; for this reason storage in bulk has advantages. Exposure to light catalyzes the absorption of oxygen; two hours exposure to sunlight cuts the induction period in half. The proportion of gum formed increases with the temperature, but this effect of temperature is different on different gasolines, and a few degrees difference may enormously shorten the induction period. The presence of water materially increases resistance to gumming.

The treatments to which the gasoline has been subjected have varying effects on gum formation. By removal of unsaturated compounds by acid treatment the induction period is prolonged. On the other hand the period of induction is shortened by the doctor treatment, due perhaps to the fact that this treatment removes certain natural inhibitors as well as mercaptans. Gasolines treated with fresh doctor solution are less stable than those treated with recovered solution, evidently due to the fact that inhibitors are slowly formed in old doctor solution. Addition of a small excess of sulphur prolongs the induction period, but a large excess rapidly decreases it.

The most convenient method of stabilizing cracked gasoline is to add inhibitors. These substances should be colorless; more soluble in gasoline than in water; not sensitive to atmospheric oxygen but reacting readily with the peroxides formed in gasoline, and they should be effective in small quantities. The inhibitors most commonly used are alpha-naphthol, monobenzyl-p-aminophenol, dibenzyl-p-aminophenol, p-aminophenol, alpha naphtylamine, Universal Oil inhibitor, and others. These inhibitors act differently on different gasolines: alpha-naphthol and alpha-naphtylamine are the most economical from the standpoint of cost, but are less

efficient than monobenzyl-p-amino-phenol from the quantity standpoint. The author appends an extensive list of substances that have been used or proposed as inhibitors.

It is generally considered that a gasoline having an induction period of 240 minutes by the bomb method under pressure of oxygen will meet normal requirements.

Petroleum Economics

History of California Crude Oil Production.—Thomas H. Sherman in PETROLEUM ENGINEER, vol. 6 (1934), No. 11, pp. C36–C41.

This historical summary is unusual in that the data are presented not in statistical tables but in the form of a graph in which the influence of historical developments on daily oil production is clearly visible. As presented by the author this history is essentially the story of factors that have promoted overdevelopment and overproduction, and the counter-efforts of the industry itself to control the situation. The machinery of this control created by voluntary action by the industry in 1930 is essentially the same as that later taken into the Petroleum Code, and has operated successfully in spite of handicaps imposed by governmental interference. The potential capacity of California oil fields as of October 1, 1934 is figured at 1,415,210 bbl. daily; the allowable production under curtailment is 452,300 bbl. It is maintained that neither the public nor the oilmen desire restrictions that will prevent the unhampered use of petroleum as it is needed, and California industry is willing and able to conform to this rule without state or national dictation.

First Things in Oil Codes.—Axtell J. Byles, in OIL AND GAS JOUR., vol. 33 (1934), No. 26, pp. 81; 90–91.

In this presidential address before the American Petroleum Institute the present politico-economic situation of the oil industry in the United States under the oil code is reviewed. The evils which afflict the industry are traced, first, to disorder in the marketing field, and second to disorder in the production field. If the provisions of the code against the loaning of service station equipment and similar practices, and the rule insuring sale of the refiner's product at the refiner's posted price were observed, two of the worst marketing evils would be corrected. If the refiners would go further and generally adopt a sliding scale of dealer margins, a further degree of sanitation would be introduced into the market. As matters now stand the refiner who allows a 2 or a 4 cent margin assumes the responsibility of guaranteeing the dealer a profit; by enforcing the sliding scale of gasoline prices the dealer is forced to bear some of the burden of price changes, and the temptation to cut prices to obtain gallonage would be somewhat abated.

The present disorder in the production field goes back to the old judicial blunder of applying the law of capture to underground petroleum deposits, and it is likely that the disorder will persist until this ancient legal error is corrected. Until this defect in the law of property rights in oil is repaired so that oil pools can be operated as units, state control and proration is at present the most logical recourse; but such measures as the Thomas-Disney bill, which would put refining operations under control of the Federal government, would mean the end of private management of the industry. In the meantime one of the greatest concerns of all responsible oilmen is the effective suppression of illegal production.

Effect of Curtailment on Ultimate Recovery.—I. V. Moore, in OIL WEEKLY, vol. 75 (1934), No. 10, pp. 27–32.

The question is raised as to whether reduced (controlled) production or unlimited production is more favorable to the general welfare of the oil industry, leaving out of consideration the economic aspects of current market conditions. As outlined by the author, the answer is clearly in favor of controlled production.

The subject is approached from the physical and oil engineering standpoints. A given pool contains only a certain amount of oil, and the operator may elect to obtain as much as possible of this oil in the shortest possible time, or to spread production over a longer period; the first alternative is short-sighted and tends to defeat itself. For physical reasons, which are clearly explained, hasty production tends to dissipate the pressure exerted on the oil by the underground gas and water so that the flowing period of the well may be and often is much shortened; in that case resort must be had to pumping, which adds greatly to the cost of production. Furthermore, the relations between the oil on the one hand and the water and gas associated with the oil are so unfavorably affected that a smaller proportion of the oil is recoverable in any event. Unrestricted production thus leads directly to high costs and to waste of oil that must be left in the ground. The best engineering opinion is that if an average oil well is allowed to flow slowly the average oil field will yield a third to a half more than under unrestricted flow, and some authorities are inclined to double these figures; at the same time production costs over the total life of the pool are cut to a third. By rational curtailment the author means reduction of the rate of production to the point where the oil goes immediately into consumption and no crude needs to be stored. This is true conservation, and is undoubtedly for the best interests of both the industry and the consuming public. Much interesting data in support of this viewpoint are cited from a number of old and new oil fields.

Cost of Refining Operations and Equipment. W. L. Nelson, in PETROLEUM ENGINEER, vol. 6 (1934), No. 1, pp. 20–21.

The thesis of this paper is that otherwise competent engineers and laboratory men in the oil business are too often poor oil economists and too often fail to see that a processing plan may be perfectly sound from the technical standpoint and yet absurd from the economic standpoint. In writing this series of papers on refinery economics the author, who is professor of petroleum refining at Tulsa, undertakes to show ways in which the economics of plant operation may be studied so as to find out the approximate cost of refining.

The data here collected show maximum and minimum cost of practically all the usual processing operations as currently applied to a typical mid-continent crude. The oilman who is considering a change in process will find here a cost-range for each major step, and data that serves to define the present economic limits of oil refining. The lower cost limit is naturally of most interest in judging competitive possibilities.

Men who make ventures in oil refining, but who are not thorough oil economists, may make two glaring mistakes, as the author convincingly shows. One of these is to overlook the advantages of large plants in comparison with plants of smaller capacity. The other, which is all the more serious because not always readily apparent, is to buy refining equipment on price instead of performance. For example a 20-plate bubble tower may cost less than a 27-plate tower but if the latter recovers more gasoline that would otherwise pass into the kerosene it may prove the cheaper apparatus in the end. It is such things that make the difference between financial success and failure.

Petroleum Products

Formaldehyde Formation by Preflame Reactions in an Engine.—Lloyd Withrow and Gerold M. Rossweiler in IND. ENG. CHEM., vol. 26 (1934), No. 12, pp. 1256–1262.

For understandable reasons the subject of knocking in a gasoline engine is a source of perennial interest. The authors of this paper, working in the General Motors Company research laboratory at Detroit, have used a new means of studying the phenomenon—the spectroscope. By means of this instrument they have found that under knocking conditions formaldehyde is always present in the non-inflamed gases and can easily be identified by its spectrum so that it affords a way to study what goes on in the engine cylinder. In observing the connection between formaldehyde and knock it was found that when knocking was purposely increased by adding isopropyl nitrite or diethyl peroxide to the fuel, the quantity of formaldehyde is increased. The quantity of formaldehyde is not always a measure of knocking proclivity, since two fuels showing the same intensity of knock under the same sets of engine conditions may not form the same concentrations of formaldehyde. It is curious to note that addition of tetraethyl lead to suppress knock does not affect the formaldehyde formation appreciably. On the other hand the absorption bands characteristic of formaldehyde disappear if the octane number of the fuel is sufficiently raised by addition of some substance other than tetraethyl lead. Addition of enough aniline to suppress knock completely reduces the formaldehyde concentration.

Propane as Fuel and Refrigerant in Truck Transportation.—Guy L. Tinkham in NATIONAL PETROLEUM NEWS, vol. 26 (1934), No. 47, pp. 32; 34.

As an automotive fuel liquefied propane is uneconomical on account of its cost and the necessity of carrying it in pressure cylinders. But when advantage is taken of other properties of this volatile hydrocarbon the case may be different. Where perishable goods require refrigeration while being transported over long distances the use of propane both as motor fuel and as a refrigerant is a commercial development now actively under way. In operation, two pressure tanks containing propane under pressure (it vaporizes at −40 deg. F.) are mounted on the truck. As it evaporates the vapor passes through tank valve, flow check valve, strainer and silica gel dehydrator; then through two expansion valves in parallel and through a heat exchanger into the cooling coils. After leaving the coils the vapor is reduced to atmospheric pressure and mixed with air in the ratio of 20 to 1 whereupon the mixture enters the motor. Buses may be air-conditioned and propelled on the same principle. A difficulty at present is servicing, but it is expected that this will be overcome when the demand becomes larger.

Petroleum Substitutes

Coal Tar Oils as Internal Combustion Engine Fuels.—H. M. Spiers and E. W. Smith, in PETROLEUM TIMES, vol. 32 (1934), No. 826, pp. 508–509.

In a report to the Institution of Gas Engineers the authors reach the conclusion that the attempt to popularize the use of coal tar oils as automotive fuels in England has failed. A thorough trial by the Belfast Omnibus Company, in which 72,000 gallons of the fuel were used in 28 omnibuses over a period of two years, confirms this conclusion. It is presumed that the story might be different if engines designed especially for this fuel were available. The coal carbonizing industry, which has most to gain from the development, might take up the matter.

Petroleum Books

Development and Present State of The Russian Oil Trade (Der Aufbau und Stand der Russische Erdolwirtschaft), by Dr. Wolfram Doellen; published 1934 by Ost-Europa-Markt, Konigsberg i/Pr., RM1.50.

This publication is a summary of all phases of the contemporary Russian petroleum industry.

Method of Using and Form of the Rotary Drill (Die Arbeitsweise und Form des Rotarymeissels), by J. Basgau; published 1934 by Verlag Hans Urban, Vienna, RM 4.

On the basis of his experience in the Roumanian oil fields the author describes the operation of the rotary drill and the accessory apparatus. There are 50 illustrations. An interesting and important feature of the work is the mathematical treatment of vibrations of the drill rod, from which a number of practical conclusions may be drawn.

The German Petroleum Districts, Their Development and Economics (Die Deutschen Erdoelgebiete ihre Entwicklung und Rentabilitaet), by H. Becker, published 1934 by Verlag Hans Urban, Vienna.

In this book the author sets forth a study of the German petroleum industry from the economic rather than from the technological viewpoint. Each field is thoroughly analyzed from the standpoint of cost of operation and value of product; the chief standard of comparison is oil production per meter of drilled hole. In this way an attempt is made to judge the merits of different districts on a standard basis.

Significance of Tests of Petroleum Products—Published 1934 by American Society for Testing Materials, $1.00.

This report, compiled by committees of the A.S.T.M., undertakes to furnish explanations of the principles on which the standard tests are based, and to guide the oil chemist and oil user in interpreting the industrial value of the results. The discussion covers all the ordinary petroleum products, including road and paving materials. The present edition is a revision, with considerable additions, of the edition of 1928.

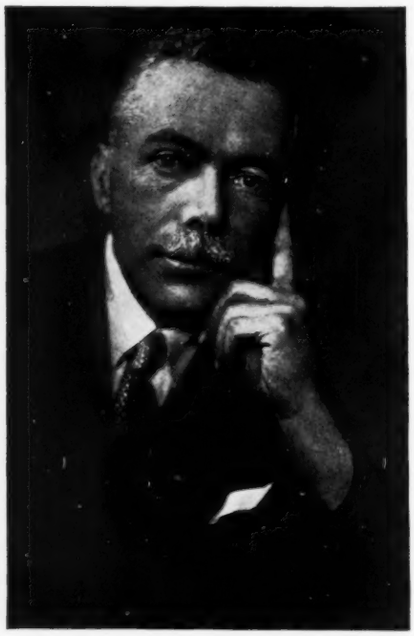
Standards of Petroleum Products.—Published 1934 by American Society for Testing Materials. $1.75.

This is the 1934–35 edition of the A.S.T.M. standards for petroleum products. The number of test methods is now 53, and there are six specifications for petroleum products; glossaries of terms applying to petroleum and road and paving materials are given. New standards are given for fuel oils, for various types of emulsified asphalts, and a new standard for gum in gasoline. Revised tests are given for sulphur in oils (by both the lamp and the bomb methods), also color tests for lubricating oils and petrolatum. Revised directions are given for color (by colorimeter), cloud test and pour point. The usual correction tables have been made larger. Tentative specifications are proposed for five Diesel oil classifications adopted to various types of engines.

Foreign Oil Legion

J. E. SOUTHCOMBE, M.Sc., director of Germ Lubricants, Ltd., London, and author of the handbook "LUBRICATING OIL TESTS AND THEIR SIGNIFICANCE", which is now in its third edition, is making a visit to Burma, India, and other eastern countries.

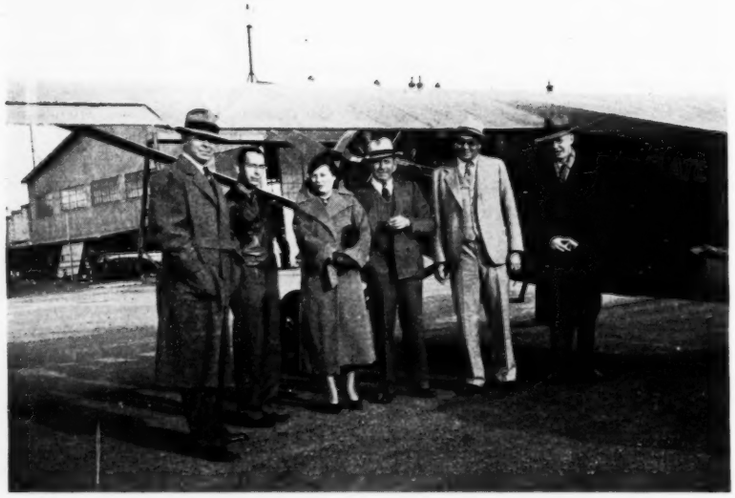
J. E. Southcombe, M.Sc.

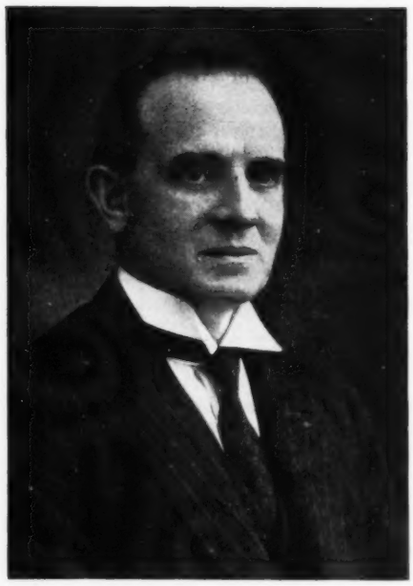


ON ONE of the coldest mornings which Californians have experienced in years, a trim Ryan six-passenger monoplane took off from the Grand Central Air Terminal, roared over the landing field in token of a last good-bye to a group of forty shivering friends who had not yet had their breakfasts, and pointed its nose towards South America.

In the plane were J. W. MacClatchie, president of the MacClatchie Manufacturing Company of Compton; S. R. Robinson, representing Alexander Anderson, Inc., of Fullerton, and the O. P. Yowell Service Company of Los Angeles; Mrs. Robinson, and Leo Root, the pilot. They will be gone from two to three months. Their itinerary includes stops at El Paso and Brownsville, Texas; Tampico and Mexico City; Cristobal in the Canal Zone; Bogota in Colombia; Maracaibo in Venezuela; and Port of Spain, Trinidad.

Reading from left to right: S. R. Robinson; Pilot Leo Root; Mrs. S. R. Robinson; J. W. MacClatchie; O. P. Yowell; and Alexander Anderson





Arthur Stephens, O. B. E.

An increase in foreign business, which indicated an extensive application of American oil equipment in 1935, led to the organization of the tour. Contacts will be made with executives and field men in the various oil producing centers visited.

ARTHUR STEPHENS, managing director, British Sun Oil Company, Ltd., was awarded the order of the British Empire in the list of England's New Year's Honours. Mr. Stephens has been associated with the petroleum industry in the United Kingdom from its early inception and his many friends throughout the country congratulate him on being honoured in the New Year's Honours list.

W. FRANK PRENDERGAST, for the past seven years advertising manager of Imperial Oil, Ltd., has been appointed assistant to the president. Mr. Prendergast, before joining the Imperial organization, had a long experience in newspaper and magazine work in Canada, and has served as president of the Association of Canadian Advertisers.

SEPTEMBER 1932 issue of WORLD PETROLEUM. Will any reader who has a spare copy of this particular number very kindly communicate with Michel Duvergier, Cie Auxiliare Navigation, 48, Rue de la Bruyere, Paris, 9e, France. M. Duvergier is anxious to purchase a copy, this issue being out of print.

William J. Wigney

WILLIAM J. WIGNEY, European manager of the National Supply Company, has accepted the presidency of the Oil Industries Club, London, succeeding James Kewley of the Asiatic Petroleum Company. The monthly luncheons and other functions of the Club afford an interesting meeting ground for men from all parts of the world who are interested in oil and oil equipment.

FRED MURRAY, vice-president of the Oil Well Supply Company, accompanied by Mrs. Murray, arrived in New York, January 17, after a pleasure trip to South America which included visits to Rio de Janeiro and Buenos Aires, a journey across the Andes to the Chilean side and thence up the west coast and through the Panama Canal. Both Mr. and Mrs. Murray were enthusiastic about the trip and said that they had enjoyed the experience immensely.

HAROLD MOORE of Moore and George, London, has resigned his position as consultant to Herbert Green and Company, who are constructing a large Duo-sol lube oil refinery in England.

C. W. A. SCOTT AND T. CAMPBELL BLACK, winners of the MacRobertson Air Race from England to Australia, were the guests of honour at a congratulatory luncheon given by the Oil Industries Club at the Hotel Metropole, London. A large and distinguished number of guests, representing the petroleum and allied industries, attended and were presented to the flyers at a reception preceding the luncheon. It will be remembered that these two men flew 11,300 miles in 70 hours 59 minutes, at an average flying speed of 176.8 m.p.h., in a specially built De Haviland Comet.

DR. V. HENNY, European director of Universal Oil Products, Inc., recently arrived in New York on the ss. 'Bremen' for a visit of several months.

J. M. PEVSNER, director of the R.O.P. is spending several months in South Africa. In his absence A. Divovitch, director of sales for R.O.P. is in charge of the London Office.

COL. H. E. MEDLICOTT acting for oil companies operating in Roumania has concluded an agreement with representatives of the Roumanian government covering claims of the companies for losses sustained during the World War. The agreement which is a revision of one previously effected was signed in Paris in December.

▼

Two Ghosts Follow Tanker

CURIOUS things happen in the world of oil but one of the strangest episodes in its history has just been brought to general attention through the publication of a book of unusual news photographs, The Breathless Moment (Alfred Knopf: $3.00). This collection includes a bona fide photograph of two ghosts who followed the oil tanker WATERTOWN, of Cities Service, were seen repeatedly by all hands and ultimately photographed by the captain. We are able to reproduce the photograph itself through the courtesy of the Cities Service Transportation Company in whose office it hangs.

Two members of the WATERTOWN's crew, Michael Meehan and James T. Courtney, died on board in an accident in 1922 while the vessel was in the Pacific en route from San Pedro to New Orleans and were buried at sea. The following day their ghosts appeared at the point on the catwalk from which the bodies had been dropped overboard and were seen clearly and frequently by officers and men until the vessel entered the Panama Canal.

Captain Tracy of the WATERTOWN duly reported the matter to his superiors, bought a camera in New Orleans and when the vessel entered the Pacific and the apparition was again seen exposed six films which were developed on returning to port with the results shown below. The photograph is unretouched except that we have added two circles to locate the faces. That in the right circle was identified by those on board as the face of Meehan while the one on the left shows only a skull.

After this the ghosts were seen on several occasions but always in the Pacific. Since the WATERTOWN was transferred to an Atlantic run no appearance has been reported.

Total 1934 Crude Oil Production for the World by Countries and by Years

(Barrels of 42 U. S. Gals.)

	Total 1932	Daily Average 1932	Total 1933	Daily Average 1933	Total 1934	Daily Average 1934	Increase or Decrease (barrels)	Increase or Decrease (percent)
United States	785,159,000	2,145,243	898,874,000	2,462,670	909,107,000	2,490,704	10,233,000+	1.14+
Russia	149,719,000	409,070	149,901,900	407,950	168,648,700	462,051	18,746,800+	12.50+
Venezuela	119,596,512	326,766	120,882,802	331,186	142,072,329	389,239	21,189,527+	17.53+
Roumania	50,491,205	137,954	50,971,200	139,647	61,569,523	168,684	10,598,323+	20.78+
Persia	45,122,455	123,285	49,581,280	135,840	52,761,604	144,552	3,180,324+	6.42+
Mexico	32,802,285	89,624	33,904,882	92,890	38,167,022	104,567	4,262,140+	12.57+
Netherland India	39,584,027	108,153	38,512,663	105,516	42,289,408	115,861	3,776,745+	9.87+
Colombia	16,384,956	44,768	13,157,127	36,047	17,340,724	47,508	4,183,597+	31.80+
Argentina	13,166,900	35,975	13,759,565	38,232	14,518,041	39,775	758,476+	5.51+
Peru	9,899,266	26,026	13,923,281−	38,146	14,143,959	38,751	220,678+	1.59+
Trinidad	10,023,780	27,387	9,560,039	26,192	10,894,363	29,847	1,334,324+	13.96+
British India	8,600,312	23,500	8,721,665+	23,893	8,997,399	24,650	275,734+	3.16+
Poland	3,905,230	10,670	3,858,085−	10,570	3,697,617	10,131	160,468−	4.15−
Sarawak	2,274,043	6,213	2,289,472−	6,273	1,948,044	5,336	341,428−	14.91−
Japan and Taiwan	1,575,333	4,375	1,377,761	3,827	1,476,012	4,044	98,251+	7.13+
Egypt	1,742,370	4,760	1,591,495	4,360	1,489,169	4,079	102,326−	6.43−
Ecuador	1,573,857	4,300	1,622,624−	4,446	1,655,062	4,534	32,438+	2.00+
Canada	1,054,373	2,880	1,147,825−	3,144	1,424,412	3,902	276,587+	2.41+
Germany	1,824,019	4,983	1,712,823	4,692	2,266,964	6,210	554,141+	32.35+
Iraq	1,200,000	3,300	1,200,000	3,288	2,411,599	6,607	1,211,599+	100.96+
France	552,000	1,508	552,000	1,515	552,000	1,512	.....	.....
Others	432,000	1,180	432,000	1,184	432,000	1,183	.....	.....
Total	1,296,712,823	3,544,940	1,417,534,489	3,884,022	1,497,862,951	4,103,734	80,328,462+	5.66+

World Crude Production Increases 5.66%

United States Crude Oil Production Shows Increase of Only 1.14 Percent Against 13.51 Percent Increase for Rest of World. Only Egypt, Sarawak and Poland Show Decreases.

DESPITE the confusion that attended attempts to control and limit the production of crude oil in the United States, some progress is noticeable in the complete figures for the year 1934. U. S. production during the past year increased only 1.14 percent or 10,233,000 bbl. over the crude oil production for 1933. While final figures are not available an increase in the consumption of motor fuel and other petroleum products of close to 6 percent will far more than balance the small increase in production and cause fairly heavy withdrawals from stocks, putting the U. S. industry in a much better statistical position than it has enjoyed for several years.

Crude oil production for all oil producing countries other than the United States increased 13.51 percent or 70,095,462 bbl. over the production in 1933. Russia, Venezuela and Roumania all contributed heavily to the increase in world production and only three countries, Poland, Egypt and Sarawak showed smaller production in 1934 than in 1933. The increase in consumption in countries outside the United States, however, is roughly estimated to exceed 10 percent.

The world oil industry on the whole should find itself in excellent statistical position with increasing consumption outstripping the 5.66 percent increase in total world oil production, an increase of 80,328,462 bbl. over the production in 1933. Indications are that the industry should begin to reap the benefits of the improved statistical position during the coming year in the form of higher prices for petroleum products.

Despite grave handicaps that have been referred to frequently during the past year in the pages of WORLD PETROLEUM, the Soviet petroleum industry increased production in 1934 by 18,746,800 bbl. or 12.50 percent over the production for the preceding year. Although this production is considerably below the quantity called for under the quotas set up in the Second Five Year Plan it represents remarkable progress on the part of the Russian industry. Consumption within the Soviet Union is increasing at a considerably faster rate than production, as a result of the introduction of farm machinery, the industrialization of the country and the large increase in the use of motor vehicles, tractors, trucks and aeroplanes. Meanwhile a certain proportion of Soviet production must be exported to maintain the Soyusnefteexport's

World Oil Production—Official Figures for 1934 Revised

All figures furnished direct to WORLD PETROLEUM by Governments, except where otherwise specified

(Figures in U. S. Barrels—Conversion ratio 7 bbl. = 1 ton)

Country	January 1934	February 1934	March 1934	April 1934	May 1934	June 1934	July 1934	August 1934	September 1934	October 1934	November 1934	Preliminary Figures December 1934
United States	71,976,000	65,450,000	75,548,000	75,796,000	79,870,000	80,040,000	81,548,000	79,058,000	75,810,000	76,776,000	72,463,000	74,772,000
Russia	13,356,000	12,488,900	14,644,000	14,081,900	14,315,000	13,966,400	14,297,500	14,287,700	13,924,400	14,260,000	14,388,500	14,638,400
Venezuela	11,091,415	9,921,765	11,238,717	11,185,076	11,768,799	12,500,307	12,193,307	12,505,304	12,381,159	12,591,390	12,274,794	12,420,296
Roumania	4,906,000	4,440,000	5,066,000	4,981,000	5,008,000	5,178,000	5,223,000	5,556,000	5,335,000	5,467,000	5,324,000	5,286,523
Persia[2]	4,164,790	3,988,502	4,483,535	4,284,231	4,648,105	4,401,223	4,577,251	4,886,462	4,955,419	4,499,530	3,822,000	4,049,556
Mexico	3,113,707	2,863,088	3,183,923	3,206,490	2,714,828	2,918,793	3,303,055	3,434,516	3,276,612	3,393,770	3,332,926	3,425,314
Netherland India	3,376,674	3,185,091	3,631,726	3,489,024	3,609,816	3,577,056	3,678,745	3,456,215	3,410,785	3,577,399	3,553,067	3,743,810
Colombia[4]	1,012,780	903,471	1,017,147	1,193,736	1,730,095	1,683,691	1,646,739	1,691,314	1,627,632	1,646,293	1,633,654	1,554,172
Argentina	1,241,591	1,111,358	1,231,978	1,128,922	1,029,074	1,096,855	1,077,502	1,210,273	1,258,812	1,678,500[1]	1,206,480[1]	1,246,696
Peru[1]	1,188,540	1,041,658	1,086,827	1,037,127	1,085,192	1,187,030	1,233,804	1,300,253	1,259,901	1,303,554	1,169,826	1,250,247
Trinidad	852,189	766,254	876,544	876,950	926,785	947,122	1,008,669	975,697	919,469	906,152	907,655	930,877
British India	782,743	699,369	808,647	759,977	796,208	749,294	785,751	762,959	752,451	700,000[1]	700,000[1]	700,000
Poland	312,333	281,946	310,800	304,500	305,592	304,437	315,861	320,145	311,003	315,000	308,000	308,000
Sarawak	172,172	158,361	176,568	166,999	166,565	158,669	164,206	161,504	155,400	156,800	152,600	158,200
Japan	119,829	110,652	122,488	118,770	126,170	125,202	131,397	129,326	124,870	125,229	119,970	122,109
Egypt	122,934	109,900[1]	121,121	117,236	130,851	132,097	135,106	131,061	124,502	123,235	116,326	124,800
Ecuador	132,655	120,900	131,566	135,226	142,869	158,826	141,474	140,944	136,033	141,079	133,490	140,000
Canada	124,425	116,546	130,046	118,890	117,693	109,021	120,772	114,778	114,242	122,056	118,830	117,113
Germany[3]	152,292	138,593	159,096	176,071	159,103	179,480	208,145	219,961	198,366	227,605	219,485	228,767
Iraq[1]	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	357,000[5]	1,034,599
France[1]	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000
Others[1]	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000
Total	118,381,069	108,078,354	124,150,729	123,340,125	128,832,745	129,395,553	131,972,284	130,524,412	126,258,056	128,192,592	122,383,603	126,353,479

[1] Estimate. [2] Anglo-Persian Oil Co. figures revised; fuel oil returned to the ground has been deducted. [3] Thuringia estimated 7,000 bbl.; official figure for Prussia. Russian Sakhalin included with Russia. Japanese Sakhalin included with Japan. [4] International Petroleum Company's figures. [5] Iraq production represented by oil shipments through Tripoli and Haifa.

position in world markets and to obtain credits necessary for the further expansion of industrialization. The result of this combination of factors is that an increase of 12.50 percent in production is hardly adequate to meet growing Soviet requirements for petroleum.

In Venezuela, where production has been closely controlled by the major companies operating in that country, an increase of 17.53 percent or 21,189,527 bbl. indicates clearly the growing demand for crude supplies. Quantitatively Venezuela registered the greatest gain in production of any of the world's oil producing countries. Part of this increase may be ascribed to a shifting in the source of supplies for European markets as a result of the United States tariff of two years ago; the balance of the increase is the result of growing demand. Although Venezuela ranks third in the list of the world's oil producing countries, it is generally considered that this South American country would experience no difficulty in regaining second place formerly occupied by it, in the event that prices on the world markets warranted so considerable an increase.

Roumania shows an increase about equal in volume to that in the United States, 10,598,323 bbl., or 20.78 percent, although little has been done to increase domestic consumption. Practically the entire increase has entered the world markets, taking the place to some extent of lower exports from Russia and the United States.

Persia shows a moderate increase of 6.42 percent or 3,180,324 bbl. over 1933 production where the entire production is under the control of the Anglo-Persian and where production is regulated to market demand to a greater extent than elsewhere. Plans for further development of the Persian fields and the construction of a refinery in Persia by the Anglo-Persian will have a more marked effect on future production when the development work is completed. It is of interest to note that Anglo-Persian is making an effort to develop production in Venezuela to augment its present Persian sources.

Poland, Sarawak and Egypt registered the only decreases in production compared with 1933 of any of the oil producing countries. The Polish situation has been covered by several articles in WORLD PETROLEUM during the past year. Due to exhaustion of old fields, the expense and difficulty of deep drilling for new fields, and government restrictions that make profits from even successful completions very doubtful, the rate of production in Poland has been allowed to decrease 4.15 percent compared with 1933. Further decrease may be looked for during the coming year if some reform of the government restrictions is not effected.

The most striking change in the list of countries is to be found in the case of Iraq where production has increased from the purely nominal figure of 1,200,000 bbl. in 1933 to 2,411,599 bbl. in 1934 when, for the last quarter of the year, oil has been flowing through the great pipeline to the Mediterranean.

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Soviet Export Trade

IT HAS recently been announced that Campsa, the Spanish petroleum monopoly which previously drew a large part of its supplies from Soyusnefteexport, has cancelled the remaining contracts to purchase petroleum and products from the Soviet Union.

Toward the end of the year an agreement was reached by which France will extend approximately 1,000,000,000 francs credit to the Soviet Union for the purchase of goods on the French market. The credit which will extend over a period of about three years involves no advance of cash to the Soviets but will take the form of the French government rediscounting Russian bills held by French manufacturers who export to Russia.

The Soviet government guarantees the credit extended by France, by oil shipments aggregating 350,000,000 francs annually. Among the materials that the Soviet Union plans to buy in France will probably be a large amount of aviation equipment and, it is said, approximately 180,000,000 francs order from the Citroen automobile company.

CANADA

Imports

IMPORTS of crude into Canada during October 1934 were 110,637,902 gallons valued at $3,327,858, compared with 118,210,821 gallons, valued at $3,524,270 for the month of September, and 91,713,858 gallons valued at $2,672,155 for the month of October 1933. The increase over the same month of 1933 is a very satisfactory indication. The seven-month period ending October 1934 showed an increase over the same period of 1933 of 52,404,796 gallons valued at $8,843,187, which again is encouraging.

Gasoline imports for October showed a steady rise from the same month of 1933, and from the figures for September. In October 1933, 1,027,204 gallons were imported, in September 1934, 1,393,307 gallons, and in October 1934, 1,606,033 gallons.

Imports of crude into Canada during the month of November 1934 showed an increase over October 1934 and also a large increase over the November 1933 figure. The November import figure for 1934 was 124,044,284 gallons valued at $3,491,463, as compared with 110,637,907 gallons valued at $3,327,858 for October 1934, and 91,761,448 gallons valued at $2,713,411 for November 1933.

Origins of Canadian Imports for November 1934

	Gallons	Dollars
United States	88,304,278	2,595,836
Trinidad and Tobago	2,648,285	74,152
Colombia	15,556,340	444,470
Peru	7,008,672	206,181
Venezuela	10,526,709	170,824

Gasoline imports showed a slight increase over the previous month, the November figure being 1,623,317 gallons valued at $137,487. The corresponding month of 1933 showed the following figures only: 760,305 gallons valued at $85,231.

Turner Valley

NINETEEN HUNDRED AND THIRTY-FOUR was a very good year for the Turner Valley. In fact, it was the best year since 1931. Preliminary figures give the naphtha production at 1,175,000 barrels, which is a most satisfactory yield. In terms of money, the returns from the Turner Valley field were approximately $2,875,000.

Among the most promising new producers for this year might be mentioned Spooner-Anaconda and Pacalta Royalties No. 1. The Highwood-Sarcee well, which was brought in last year, is now producing over 300 barrels per day; Carleton Royalties is producing over 100 barrels, and Director Royalties is producing more than 100 barrels per day.

The Alberta Government has increased the royalty on production from 5 to 10 percent, and this legislation went into effect January 1st, overriding the opposition of oil operators and others.

General Developments

THE first annual general meeting of Champlain Oil Products Limited has been held at Montreal, and the shareholders considered and approved the financial statement for the period January 1, 1933 to July 31, 1934. Harry Snyder, president, acted also as chairman, and in his remarks to shareholders said, in part:

> Your company began operations on December 28, 1932, and at that time through the issuance of capital stock, acquired the following companies: LaSalle Petroleum Refinery, Ltd.; Automobile Owners' Association, Ltd.; Excel Petroleum, Ltd.; Loyal Oil & Gas, Ltd.; Sylvestre Oil Co. Ltd.
>
> Subsequent to the acquisition of the aforementioned companies, United Auto Service, Ltd., R. Hotte Oil Co. Ltd., and Adanac Oil & Gas, Ltd., were acquired, and during the period covered by the financial statements Eastern Oil Co. Ltd., National Oil and Gas, Ltd., as well as the assets of Shawinigan Oil and Gas, Ltd., and J. Forget were acquired. In addition thereto, $146,000 was expended in permanent plant and other properties, the whole without additional financing and out of working capital.
>
> Uniformity of distribution through service stations and dealers' outlets has been established and your company now owns or controls service stations and has dealer outlets, all aggregating approximately 740. These gasoline outlets receive their supplies through 17 bulk storage plants, several of which have been established in new districts. Delivery of products to the retail and consumer trade is handled by 55 motor trucks owned by the company and 10 additional trucks owned by our commission agents.
>
> New bulk plants have been strategically placed at Ste. Agathe, St. Scholastique, Valleyfield, Shawinigan Falls, St. John and Epiphanie. Distribution and expansion are being co-ordinated so that eventually all available markets will be closely linked with our bulk and distributing units.

In the Turner Valley field, Imperial Oil Limited, through its subsidiary, Royalite Oil Co. Ltd., are to drill a well offsetting Model No. 1. Rotary equipment will be used and drilling will commence as soon as the derrick can be completed. Since the Model well has done over 150 bbl. a day from a point only 100 ft. in the lime, keen interest will be shown in the progress of the new well, and Royalite will give very thorough tests to the crude producing lime.

Owing to the conservation regulations in effect in the Alberta field, many companies have sold their holdings to the Royalite Oil Company, and it is probable that this company will eventually absorb most of the Turner Valley wells. The Home Oil Company, Limited, have recently sold their Turner Valley holdings to the Royalite Company for 20,000 shares of Royalite stock. This action was thought advisable since the wells operated there by the Home Oil Company were showing signs of rapid diminution, and although this may result in a smaller revenue to start with, it will doubtless prove to be the best course in the long run.

The provinces of Saskatchewan and Manitoba are showing great interest at the present time in the reported discovery of oil six miles south of Hudson Bay Junction, and it is claimed that so far over 50 sections have been leased in the vicinity and more than $3,000 has already been paid to the Department of Natural Resources at Regina in connection with this development. Oil in commercial quantities has yet to be proved, but the Senator Oil and Gas Company of Ottawa, Ontario, hold the lease and will in all probability extend their drilling operations in this neighborhood.

As far back as 1932 a small test well was drilled and the work done then was carried on under the supervision of W. B. Fry, oil geologist for the Petroleum Gas and Engineering Company of Winnipeg, Manitoba. A year ago the Trail Blazer Oil and Gas Company of Regina, Saskatchewan, commenced the present well but suspended operations for the winter months. Last spring the well was carried down about 300 ft. The Senator Oil and Gas Company commenced a well slightly to the north of the first drilling, and finally it was arranged for the Petroleum Engineering Company to take over the drilling of the first well also. About two months ago a 12-inch hole was drilled to 510 ft., at which depth casing was cemented. The well went through 40 ft. of lime, 50 ft. of gypsum, and at 590 ft. came into contact with a heavy oil sand with sufficient rock pressure behind it to force it up about 100 ft. in the hole. Work is progressing on the discovery, and further reports are expected in due course.

Announcement has just been made that an analysis of the crude from the Hudson Bay Junction well indicates that the sands have a high crude oil content. Petroleum experts of the federal government have been working on the discovery and their results have been very satisfactory. Drilling was suspended at about 600 ft. to set casing, and it is thought probable that production will be reached in the next 100 ft. Dr. Donald E. MacDonald, formerly in charge of field operations in Central America for the Sinclair Oil Company, and W. B. Fry, are working together in a geological survey of the field.

The temporary suspension of refining activities at the Regina, Sask., plant of Imperial Oil Limited may cease and operations may be resumed on a limited scale after a study of the situation resulting from the new freight schedules from the United States' mid-continent areas. The new rates increase transportation costs to Regina about 17 cents a

barrel of crude oil, and therefore operations have had to be curtailed for the time being. The refinery, however, is stocked sufficiently to supply consumer demand for 12 months.

The Province of Ontario has made an important move in the matter of oil royalty regulations. Unregulated sale of oil leases, mineral deeds, oil royalties and oil interests is now to have a number of regulations placed upon it. This is the work of the Ontario Securities Commission, and already they have begun their work by forbidding a certain percent of literature and advertising which has been thought misleading. No sale can now be conducted except under trusts established by agreements with trust companies in the province and the latter cannot accept certificates of title for underlying deeds or interests unless given proof that earnings have been at the rate of 18 percent per annum for the three months preceding assignment to the trustee. Also that rate of income must be maintained for another nine months. This is the most important of the new regulations, and the Commission holds the right to amplify or alter regulations as they consider necessary in the future.

R. C. ROWE

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SHIPPING

ANGLO SAXON, reported earlier in the month as considering an order for fifteen or twenty additional tankers of nine and twelve thousand tons deadweight capacity, and limiting the time on which tenders could be received to February 15th, announced on February 1, the placing of orders for five tankers with Harland and Wolff, Swan Hunter and Blythswood. More orders to be distributed among continental shipyards will probably be announced soon.

Tanker Construction

LLOYD'S Register of Shipping reports that at the end of 1934 no fewer than 44 oil tankers were under construction in the shipyards of the world, exclusive of the Soviet Union. These tankers aggregate 388,070 deadweight tons. Thirteen are under construction in British shipyards.

IN TANKSHIP circles a noteworthy event of the early weeks of 1935 was the going to trials of the ANCYLUS, first to be completed of the Anglo Saxon Petroleum Company's new fleet with which the writer had the opportunity to become acquainted in mid-January. As already reported the company's program provides for twelve fast, economical motor tankers with a total tonnage of about 145,000 tons deadweight capacity. The ships, of which ANCYLUS is a typical representative are remarkable for their speed of about 12 knots in loaded condition in all weather and for the power they develop on a single screw with a single-acting 4-cylinder airless injection Diesel.

This order—followed shortly after by six similar orders on behalf of the associated Eagle Oil and Shipping Co.—has provided much work for European shipyards and it is confidently expected that should the trials of the other ships in the Anglo Saxon group prove as successful as have been those of the ANCYLUS, a further big constructional programme may be expected shortly. The Eagle Oil tankers, it should be mentioned, are practically duplicates of the Anglo Saxon ships.

The ANCYLUS is a remarkable ship considered from a performance standpoint, and the incidence of the group of which she is the forerunner is likely to have a marked effect upon the tanker charter market. The new vessel has been built by Messrs. Hawthorn Leslie & Co. Ltd.,—a Tyne built ship in fact—and has dimensions 460 ft. between perpendiculars, 59 ft. beam, and 34 ft. depth to the main deck, on which is a forecastle with screw accommodation, a bridge deck with cabins for the navigating officers, as well as a comfortable saloon, spare cabins, promenading space and stores.

On the poop is a long engine casing with European and native galleys at the aft end and an engineers' smoking room at the forward end. The special Hastie steam-hydraulic steering gear is arranged at the aft end in the cruiser stern. This apparatus is of a new type, and it is intended to publish a description thereof in the near future.

The hull is divided by two continuous fore and aft bulkheads and by the appropriate number of transverse bulkheads into seven triple tanks, making 21 compartments in all. There are also two cargo pump rooms, two cofferdams, a dry cargo hold forward and below this a deep oil tank. Oil fuel is also carried in a deep tank forward of the motor room and in the double bottom tank under the motor room, the fore and aft peaks being arranged for water ballast. Four duplex steam-driven pumps are fitted for dealing with the oil cargo.

Main propulsive power is supplied by a Hawthorn Leslie,—Werkspoor 4-cycle, single-acting airless injection, continuously supercharged engine having eight cylinders, 25.59″ diameter and 51.12″ stroke. Rated for 3,600 b.h.p. at 120 r.p.m., the engine has fresh water cooling for the pistons and salt water cooling for the cylinders. It is continuously supercharged on the Werkspoor under-piston system, whereby the space between the lower edge of the liner and the top of the crankcase is closed by light aluminum covers and used for pre-compression of the combustion air. This space is provided with a valve chamber with automatic disc-type suction and delivery valves. Atmospheric air is taken from a suction manifold and the compressed air is delivered to a receiver from which it is led to the inlet valve of the cylinders.

In general appearance and construction the engine is similar to previous engines of the Werkspoor type with the bedplate flush on to the tank top. The engine drives all the pumps required for its own operation—salt and fresh cooling water pumps, bilge, sanitary, lubricating oil and fuel oil transfer pumps, the first four named being rotary screw pumps and the latter reversible Stothert and Pitt units.

The main engine exhausts into an oil-fired auxiliary Scotch boiler, which with exhaust gas firing, supplies steam for all auxiliary purposes, including steering, at sea. In port, burning crude oil, it supplies steam to the deck machinery and cargo pumps as well as for cargo heating.

THIS ship as a forerunner of a large group of future construction, is of special importance and it was announced during the trials that further orders were in contemplation and that bids were being taken which were required to be received by the Anglo Saxon Oil Co. before the end of January. There is no doubt that these vessels will be even more economical than the ANCYLUS herself and such being the case, the repercussions of vessels of this kind upon the world tanker freight market are likely to be heavy ones. It is quite definite that the modern type tanker can make money at a freight rate probably less than half that required to cover the operating costs of the older type of tramp tanker.

A. C. HARDY

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Wilshire's Cracking Unit

WILSHIRE Oil Company of Los Angeles is preparing to erect a combination Dubbs cracking unit with a daily charging capacity of 12,000 bbl. crude and 7,800 bbl. cracking stock. This will be one of the largest single cracking units on the Pacific Coast. A licensing agreement covering this plant has been signed with Universal Oil Products Co. which controls the Dubbs process. The new plant is expected to cost between $750,000 and $1,000,000.

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FOR the purpose of refinery sites at Haifa and Tripoli the Iraq Petroleum Company Ltd. has acquired 800 acres of land at each of these two respective ports. It is understood that no definite arrangements have yet been made to build a refinery on either of the sites.

U. S. S. R.

Official Figures for Soviet Oil Operations

1934	Crude Production (bbl.)	Daily Average (bbl.)	Run to Stills (bbl.)	Drilling (feet)
January	13,356,000	430,840	11,680,000	317,011
February	12,488,900	446,000	10,621,800	321,509
March	14,644,000	472,000	12,257,000	360,096
April	14,081,900	469,397	12,637,100	353,311
May	14,315,000	461,774	13,101,900	384,793
June	13,966,400	465,546	12,363,400	385,387
July	14,297,000	461,210	12,744,900	402,267
August	14,287,700	460,893	12,693,200	353,099
September	13,924,400	464,147	11,969,300	318,123
October	14,260,000	473,970	11,799,900	319,126
November	14,388,500	478,335	11,212,600	291,466
December	14,638,400	472,206	11,659,900	316,710
Total 12 months 1934	168,648,700	458,042	145,141,000	4,122,898
Total 12 months 1933	149,901,900	407,096	131,591,300	2,789,253
Quota 1934	214,900,000	588,876	161,000,000	4,950,000
Quota 1933	170,800,000	467,670	135,000,000	3,315,000
Quota 1935	168,648,700	639,452	171,500,000	7,000,000

Crude Conversion: One ton=seven bbl.

TOTAL crude production of all Soviet oil fields for 12 mos. 1934 although 45,251,300 bbl. below the plan for the year shows an increase of 18,746,800 bbl. over last year. Run to stills are likewise below plan for the year about 18,000,000 bbl., and about 10,000,000 bbl. above the figure for last year.

WORLD PETROLEUM made a forecast in May, 1934 which compares with the actual accomplishments as follows:

	Crude Production (bbl.)	Run to stills (bbl.)
Soviet Plan 1934	214,900,000	161,000,000
W. P. Forecast	170,000,000	146,000,000
Actual Operations	168,648,700	145,141,000

The increase effected in crude production during the year took place exclusively in the Baku oil fields. Crude production of Grozni fell from 34,000,000 bbl. in 1933 to 24,500,000 bbl. in 1934. All other Soviet oil fields outside of Baku and Grozni show slight decreases. The total for all these fields during 1934 amounted to about 11,000,000 bbl. as against 12,500,000 bbl. of crude in 1933. The Baku fields have thus offset the decreases of crude production at all other Soviet oil fields and have effected an increase in the total for all Soviet crude production.

A total of about 28,000,000 bbl. of Baku crude were shipped to Grozni over the Caspian sea to Makhatch Kala and thence by pipeline and rail in order to keep the Grozni refineries in operation. The total refining capacity of Grozni and Tuapse aggregate about 100,000,000 bbl. per annum.

During the entire year the Soviet oil industry has been laboring under difficulties and shortcomings the specific nature which WORLD PETROLEUM has outlined on several occasions. Apart from lack of adequate equipment and technical necessities or irregular and inexpedient distribution of equipment, the cardinal shortcomings were admitted by the Soviets as weak organization and inadequate transport facilities. Another factor hindering progress is the inadequacy of exploration of new oil lands and resources in order to cover losses of production incurred by exhaustion of fields and wells under exploitation.

The fact that this was not noticeable at Baku to such a degree as in other Soviet oil fields is undoubtedly due to the geological nature of the oil properties, or better accessibility of natural reserves as compared with other fields. Then again Baku has more and better facilities for wildcatting and development at its disposal. At Grozni and other North Caucasian oil regions such as Maikop and Benoi the proven lands are less accessible. The geological formations are of broken and irregular nature, and the oil bearing sands are situated at lower depths which makes drilling difficult in view of the fact that deep drilling is still a weak point in Soviet operations.

Emba, Georgia, Middleasia as well as the recently discovered oil center of the Urals are devoid of roads and communication presents a serious problem. These regions are mainly steppe land or semi deserts with little vegetation and water. The population is of nomadic type and under the conditions prevailing it may take years before crude production of these fields will become an appreciable factor of commercial value.

Some progress has been noticed during the year in the Maikop properties. The daily average has increased from about 13,000 bbl. at the beginning of the year to about 19,000 bbl. of crude at present.

Generally speaking Soviet oil operations when compared with operations in the United States, have two cardinal factors at disadvantage, namely exploration of new oil lands and average production per well. Over 30 new fields were developed in the United States during 1934. During the same period only one new oil field came under production in U. S. S. R. and all wells producing less than 75–100 bbl. of crude per day were shut in as non paying.

Soviet geologists have repeatedly given warning of the necessity of new exploration, but these warnings were overlooked. Production of crude at Grozni fell from 56,500,000 bbl. in 1931 to 53,900,000 bbl. in 1932 and from 34,100,000 bbl. in 1933 to about 23,500,000 bbl. in 1934.

Exploration drilling at Grozni fell from 58,000 feet in 1931 to about 40,000 feet in 1932 and 45,000 feet in 1933. Only in 1934 did it come up to about 80,000 feet but the ratio of exploration drilling in percent to all drilling fell from 17 percent in 1933 to 12 percent in 1934.

Another important factor contributing to shortcomings of the Soviet oil industry is the problem of refining.

The industrial growth of the country and mechanization of agriculture have created new demands for petroleum products among which gasoline has become a dominating factor. While kerosene and fuel oil were the main products in demand during the First Five Year Plan period, gasoline has become foremost during the Second Five Year Plan period. Motor cars, tractors, combines have grown in use and aviation has become an important medium for transportation. Tractors are driven on ligroin instead of kerosene as before and ligroin is a product of rectification between gasoline and kerosene or in other words the heavy end of gasoline.

While during the two years 1933–1934 the demand for kerosene has increased 50 percent the demand for gasoline has increased 170 percent over previous years and in tempo with the industrial development it is likely that the demands for petroleum products will grow further during the remaining three years of the Second "Piatiletka."

Total Soviet Refining Capacities

	1932	1935	1936*	1937*
Straight Run (bbl.)	165,900,000	163,450,000	182,000,000	192,000,000
Cracking (bbl.)	21,200,000	29,600,000	42,500,000	46,700,000

* Planned.

In 1934 this refining capacity yielded 4,520,000 tons of kerosene, 3,600,000 tons of gasoline; by 1937 it should yield 5,600,000 tons of kerosene against domestic and export requirements of 7,500,000 tons of kerosene, and 5,912,000 tons of gasoline against estimated requirements of 11,500,000 tons of gasoline.

Judged by the present tempo of refinery building it is evident that no material improvement of the situation is to be expected during 1935 and 1936 owing to the fact it takes almost three years to build a refinery in Soviet Russia by means of domestic design.

J. WEGRIN

United States

	Daily Crude Oil Production bbl.	Daily Runs to Stills bbl.	Total Motor Fuel Stocks bbl.	Imports for week bbl.	California Shipments East for week bbl.
Week ending Dec. 15	2,432,000 411,500*	2,525,000	51,107,000	730,000	447,000
Week ending Dec. 22	2,447,000 420,500*	2,570,000	51,468,000	1,304,000	752,000
Week ending Dec. 29	2,455,500 430,500*	2,580,000	53,385,000	1,087,000	161,000
Week ending Jan. 5	2,385,500 431,500*	2,440,000	53,468,000	831,000	59,000
Week ending Jan. 12	2,538,500 423,900*	2,510,000	55,309,000	620,000	

Underlined figures indicate improvement in statistical position—decrease in production, runs to stills, gasoline stocks and imports.

*** Estimated total production of the Rusk-Gregg field, East Texas, official and unreported.**

U. S. Supreme Court Rules Section 9 (c) Unconstitutional

On January 7 in the first U. S. Supreme Court decision on the constitutionality of the National Recovery Act the Court held the oil production control provisions invalid. The decision was made in the famous Panama-Amazon case. The decision handed down by Chief Justice C. E. Hughes ruled unconstitutional Section 9 (c) which reads as follows: "The President is authorized to prohibit the transportation in interstate and foreign commerce of petroleum and the products thereof produced or withdrawn from storage in excess of the amount permitted to be produced or withdrawn from storage by any state law or valid regulation or order prescribed thereunder, by any board, commission, office, or other duly authorized agency of a state."

The decision was very definitely based "not on the intrinsic importance" of the oil law but on the "constitutional processes of government." In other words the Court expressed its opinion fundamentally not about oil control legislation and not about interstate shipments, but only upon excessive and unconstitutional delegation of legislative power to the President by Congress and upon absence of "due process."

The immediate result of the decision was the abolition of the Federal Tender Board in the East Texas field, the State Tender Board, operating under new state legislation, taking over the work of the Federal Board.

In the face of the decision of Supreme Court holding Section 9 (c) unconstitutional the oil industry remained calm, while the East Texas field continued under effective control, "hot" oil shipments from the field not exceeding 5,000 bbl. per day and moving out of the field only by trucks. The State Railroad Commission was gradually extending its grip over highways with the purpose of reducing leaks through these channels. One reason for the increased vigilance of the state authorities, with the abolition of Federal Tender Board, presumably was the fact that the Supreme Court's decision put Texas state officials in a position of sole responsibility.

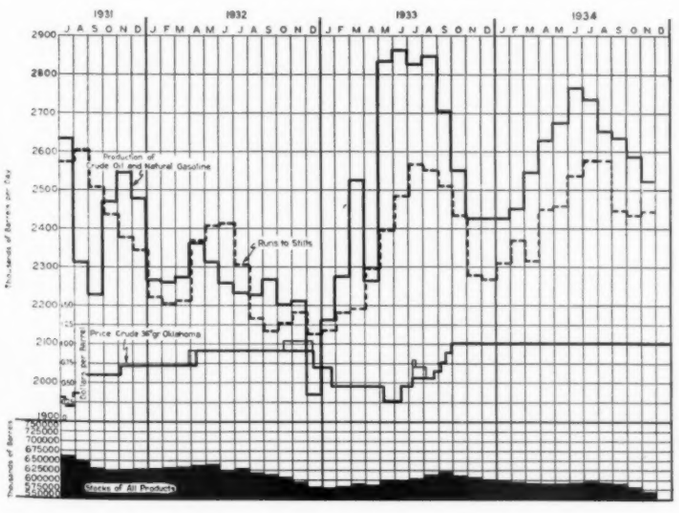
All interested groups in Texas, regardless of their attitude towards "hot" oil production, are unanimously against federal regulation, and they realized that failing effective proration control in the East Texas field, the federal administration might use the resulting excess production of "hot" oil and the lower prices as a club to force a federal control law through the Congress now in session.

Meanwhile the Petroleum Administrative Board continued to determine the market demand and will periodically recommend allocations to the oil producing states. It is indicated that it will have full cooperation of Texas Railroad Commission and the Oklahoma Corporation Commission.

Congressional Committee

The Congressional Sub-Committee investigating the oil industry, headed by William P. Cole, Jr., Maryland, submitted its report on January 3. The sub-committee expressed itself in favor of state compacts and federal legislation to make such compacts possible; it also favored legislation establishing perma-

U. S. production, runs to stills and price of crude oil in relation to stocks of all petroleum products.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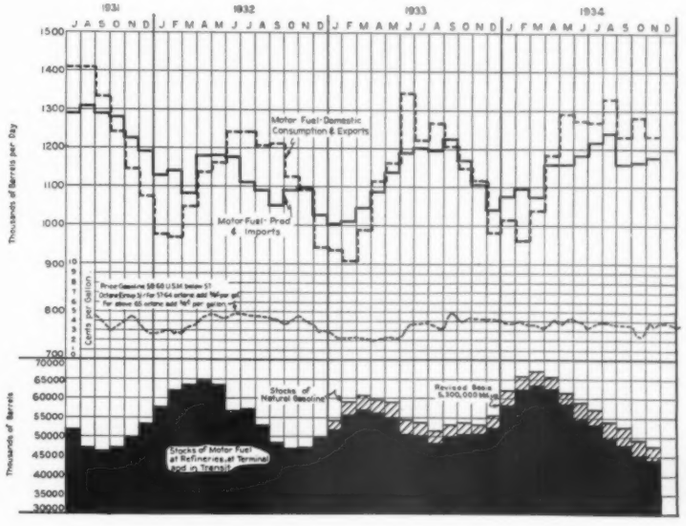
U. S. consumption and exports, production, imports and prices of motor fuel in relation to motor fuel stocks.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Motor Fuel-Prod & Imports
Stocks of Natural Gasoline
Stocks of Motor Fuel at Refineries, at Terminals and in Transit

nently a federal agency for study of supply and demand, reserves, production methods and other factors of the oil industry.

The sub-committee was expected to submit a second report with more definite recommendations subsequent to the Supreme Court decision.

Second Governors' Conference

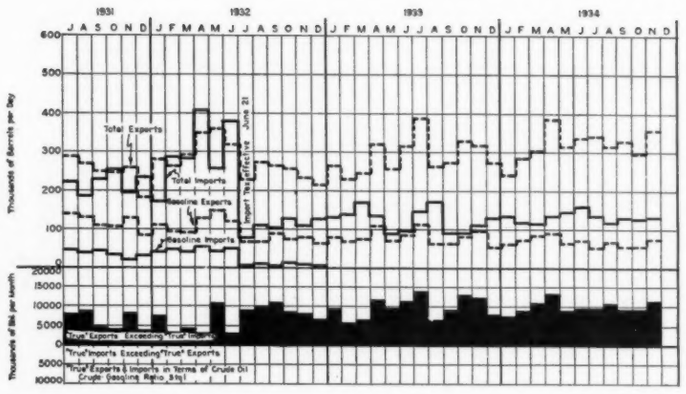
ON JANUARY 3 a second conference of governors, or their representatives, of oil producing states took place in Ponca City, Oklahoma. Ground was laid for future work, the conference limiting itself to requesting the United States Congress "to pass legislation permitting the oil producing states to enter into a compact for the conservation of petroleum and the prevention of waste" and to a resolution agreeing to submit to their respective legislatures bills authorizing representatives of states to meet and to adopt a compact. The conference also approved a federal and state cooperative fact finding board on the strength of whose recommendations the state control commissions will act. An attempt on the part of T. Johnson of Kansas to insert into the resolution a clause giving the President authority to set quotas and enforce them in states refusing to abide by the rules of the joint fact finding agency was defeated by Texas, Arkansas, Louisiana, and New Mexico voting against the plan.

Dow Acid Patents Held Invalid

ON JANUARY 15 Federal Judge F. E. Kennamer of Tulsa, Oklahoma, ruled that the acid treatment process used to increase the flow of gas and oil wells is not patentable. Accordingly the application of Dow Chemical Company of Midland, Michigan, for an injunction against the Williams Brothers Well Treating Corporation of Tulsa was dismissed. Judge Kennamer held that the patents held by Dow Chemical Company, secured on June 30, 1932, were invalid because hydrochloric acid was used as a solvent for limestone in wells as early as in 1900, while the use of inhibitors to protect the casing and the well equipment was known prior to 1928. The case is to be appealed to the Circuit Court of Appeals and, if necessary, to the Supreme Court.

Price Trend Firm

FOLLOWING the Supreme Court decision outlawing Section 9 (c) of the NIRA a brief selling flurry took place in refinery gasoline markets in Mid-Continent and Chicago areas, but the declines were very small, and prices recovered most of the ground lost when it became apparent that the East Texas field continued under effective control of the state Railroad Commission. In actual fact production in the East Texas field until the middle of January remained within the allowable, influenced by the desire of state officials and the operators to avoid at all cost stringent federal supervision.


1931
1932
1933
1934
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Thousands of Barrels per Day
Total Exports
Total Imports
Gasoline Exports
Gasoline Imports
Import Tax Effective June 21
Thousands of Bbls per Month
"True" Exports Exceeding "True" Imports
"True" Imports Exceeding "True" Exports
"True" Exports & Imports in Terms of Crude Oil
Crude Gasoline Ratio, 3 to 1

Total U. S. imports and exports and gasoline imports and exports in relation to true exports exceeding true imports.

Thus during the past month the refinery gasoline quotations in United States continued firm, while crude oil ruled without change. One effect of the Supreme Court's decision was, however, to delay the anticipated increases in prices of crude oil and refinery gasoline, which were freely predicted prior to January 7. Retail motor fuel prices improved throughout the country with gradual settlement of price wars. A very considerable improvement occurred in the eastern states where price advances took place in northern New York, metropolitan New York, New England and Kentucky, while on January 8 the Standard Oil Company of Indiana advanced service station prices 1.8 cents per gallon in Chicago territory. Kerosenes, fuel and gas oils were seasonally strong and in good demand.

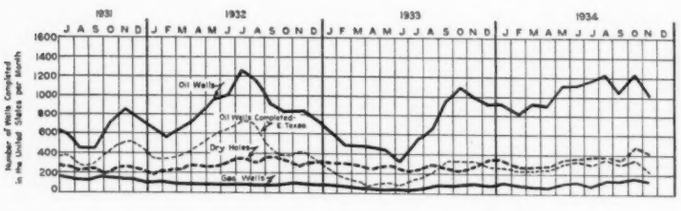
Trading in gasoline futures on the New York Commodity Exchange is scheduled to begin on February 5, while trading in crude oil futures will be somewhat delayed, pending final arrangements. Each "contract" in gasoline futures trading will call for delivery of 42,000 U. S. gallons on the basis of measurement at 60 degrees Fahrenheit; of U. S. motor gasoline, as per Federal Specification VV-G-101, within the range of 55 to 59 octane numbers; 60 to 64 octane grade is to be quoted at a premium of ¼ of a cent per gallon; and 65 and above octane grade will be deliverable at a premium of ½ of a cent per gallon. The deliveries are to be made at seller's option from licensed storage tanks in Houston-Galveston area, Texas, at "contract" price; or in New York Harbor at 5/16 of a cent above the "contract" price. It is planned to provide for evaporation losses in the storage rates. The beginning of trading in gasoline futures will be watched by the industry with great interest.

Crude oil prices have remained unchanged in the principal producing fields. In Pennsylvania an advance of 15 cents per barrel was announced on January 4, lifting the price to $2.20 a barrel in Bradford-Allegheny district and to $1.82 a barrel in Eureka Pipe Line.

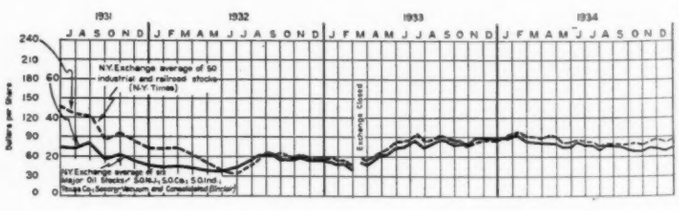
Tank wagon/service station motor fuel prices per gallon, regular grade, including all taxes, in representative districts in the middle of January were: 12.5/16.0 cents in metropolitan New York (12.2/15.7 cents in Newark, N. J.); 12.5/16.0 cents in Boston, Mass.; 11.5/15.0 cents in Providence, R. I.; 14.6/16.6 cents in Chicago; 15.5/17.5 cents in Ohio; 16.5/18.5 and 15.5/17.5 cents in San Francisco and Los Angeles respectively; 15.0/17.0 cents in Oklahoma; 12.7/12.5 cents in St. Louis (14.1/11.0 cents in East St. Louis) and 24.0/27.0 cents in Montreal, Canada; all with a 2-cent differential for premium grade.

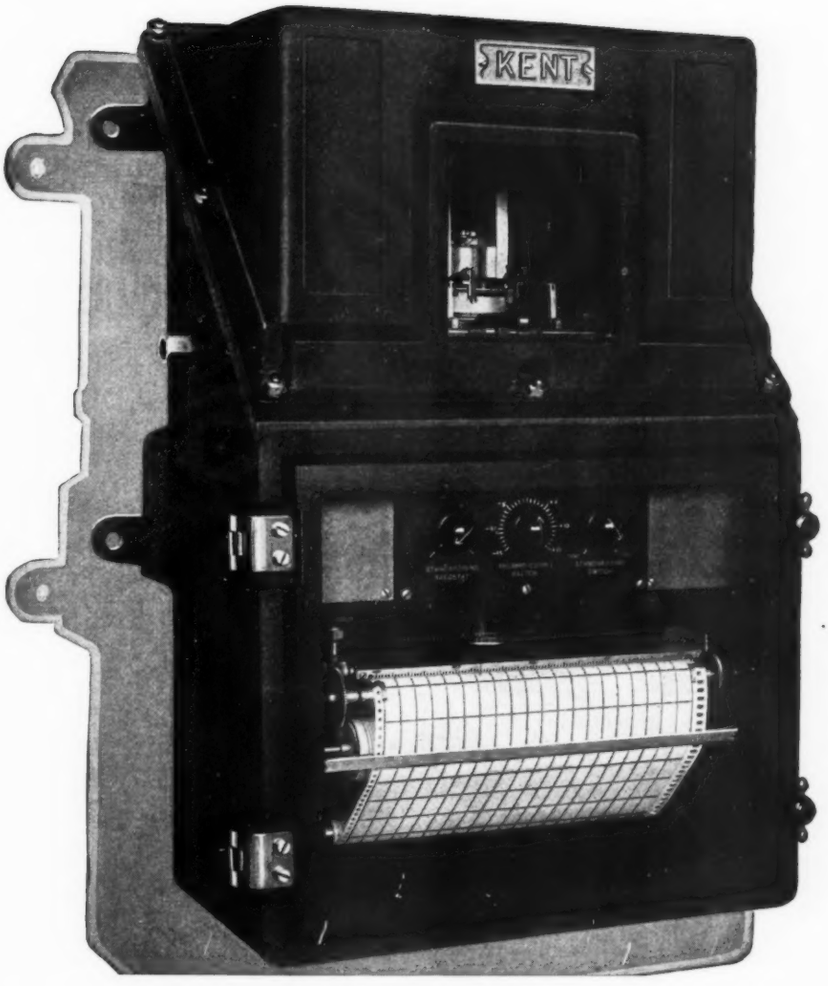
Refinery gasoline quotations in the Mid-Continent district continued steady during the past month, with the exception of a brief quarter cent recession around January 8. Refinery gasoline was quoted on January 15 in a strong market at 3⅝–3⅞ cents per gallon for 58–60 U. S. M. grade 62.9 and below octane rating in Group 3, Oklahoma market; 63.0–70.9 octane rating, U.S.M., brought 4½–4¾ cents per gallon; and 71 and above octane rating, U.S.M. was quoted at 4¾–5 cents per gallon. In East Texas area gasoline qualified for tender shipments was quoted at 3½–3⅝ cents per gallon for third grade product, while sales of "hot" gasoline for truck shipments were available in a very limited volume at 2 to 2½ cents per gallon. A favorable influence

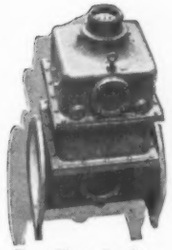
U. S. drilling; comparison of oil wells, dry holes, and gas wells.


1931
1932
1933
1934
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Number of Wells Completed in the United States per Month
Oil Wells
Oil Wells Completed-E. Texas
Dry Holes
Gas Wells

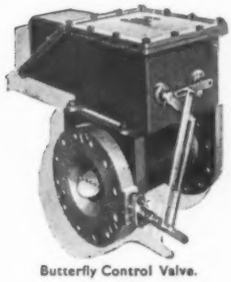
Six major oil stocks in relation to 50 industrial stocks on the New York Stock Exchange.


1931
1932
1933
1934
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Dollars per Share
N.Y. Exchange average of 50 industrial and railroad stocks (N.Y. Times)
Exchange Closed

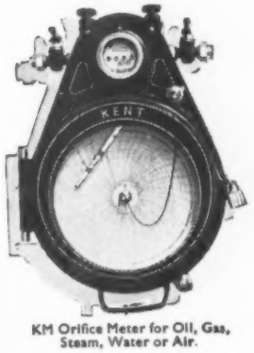




Shunt Meter for Gas.



Butterfly Control Valve.



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GEORGE KENT

Effect of Federal Proration Orders in Principal Producing States

	Sept. 1933 to Dec. 1934 Cumulative Overproduction		Dec. 1934 Over-production	Jan. 1935 Federal Daily Quota	Daily Average Production for week ending	
	bbl.	% of Total	bbl.	bbl.	Jan. 5 bbl.	Jan. 12 bbl.
Texas	33,864,000	56.6	237,000	1,006,800	1,007,500	1,003,000
Oklahoma	10,335,000	17.3	*	489,300	407,000	513,000
California	7,028,000	11.7	567,000	473,900	468,000	508,000
Kansas	2,005,000	3.3	34,000	137,100	137,500	138,000
United States	59,833,000	100.0	1,460,000	2,460,300	2,385,500	2,538,500

*Oklahoma underproduced 43,000 bbl. during December.

in the Mid-Continent area was the renewed buying of limited volume of distress legal gasoline by major refiners. On the East Coast, at Bayonne, U.S.M. grade 60.0–64.9 octane rating, was quoted unchanged at 5½ cents per gallon (3.25 cents gold*) Gulf Coast prices for export on January 15 were ¼ of a cent above the preceding month, grade 58–60 U.S.M. being quoted at 4⅛–4¼ cents per gallon (2.44 cents gold*).

Natural gasolines weakened somewhat during the past month with diminished demand and on January 15 grade 26–70 was quoted at 3½ cents per gallon (2.07 cents gold*) in Oklahoma; at 3¼ cents per gallon (1.92 cents gold*)in North Texas; and at 3¾ cents per gallon (2.21 cents gold*) in North Louisiana.

Kerosene prices continued strong and steady and on January 15 grade 41–43 w.w. was quoted at 3⅜–3½ cents per gallon in Group 3, Oklahoma market; and at 5¾–6 cents per gallon (3.46 cents gold*) on the East Coast at Bayonne; Gulf Coast prices for export advanced to 4¼–4⅜ cents per gallon (2.53 cents gold*) for 41–43 p.w. grade.

While at the present time the statistical position of the oil industry, together with the lack of any new major oil field discoveries in the past three years, warrants higher prices for both crude oil and motor fuel, the indefiniteness of the production control measures and the unsettled retail marketing continue to hold quotations at current levels. In some quarters the belief prevails, however, that more settled conditions will be established within the next four months and that higher crude oil and gasoline prices will prevail during the coming summer.

Exports Increase—Gold Clause Before Supreme Court

DURING November, 1934, total gross imports of all petroleum products into the United States were maintained at the average rate of the past 13 months, amounting to 3,809,000 bbl., 127,000 bbl. per day, as compared with 3,744,000 bbl., 120,000 bbl. per day, imported during the preceding month. The above figures are for total imports including crude oil shipped in bond for refining and re-export, and fuel oil for supply of vessels in foreign trade. Crude imports in bond are not available at this writing, but 435,000 bbl., 14,000 bbl. per day, of gas oil and fuel oil were imported during November for re-export, bringing the apparent net imports to 113,000 bbl. per day, not including any crude oil that might have been shipped into the United States in bond.

*U. S. Dollar at 41 percent discount.

Exports of all petroleum products, including motor fuel, during November, 1934, registered an appreciable increase to 10,811,000 bbl., 360,000 bbl. per day, as compared with 9,234,000 bbl., 298,000 bbl. per day, shipped during October, 1934; and were 11.96 percent above total exports in November of 1933. Exports of crude oil from the United States during November of 1934 amounted to 4,680,000 bbl., as compared with 3,277,000 bbl. shipped during the preceding month, an increase of 42.80 percent. 3,305,000 bbl. of crude oil were exported from the United States in November of 1933. Therefore, in November of 1934 crude oil constituted 43.25 of the total exports of all petroleum products.

The gold clause case now pending before the U. S. Supreme Court, if decided against the Government will greatly affect the export trade of the United States because it is thought it may force the re-establishment of the U. S. dollar to its former gold content. The gold clause in Government bonds has been abrogated by the Congress on June 5, 1933, but the first test case did not reach the Supreme Court until early January, 1935.

The magnitude of the case may well be understood when it is realized that the fate of about $100,000,000,000 of private and public gold clause bonds is at stake; if redeemable under gold clause these securities would be valued at 169,000,000,000 re-valued dollars.

Colonel Leonard P. Ayres, noted economist for the Cleveland Trust Company, expressed an opinion that if the Supreme Court rules against the Government, Congress would probably immediately restore the dollar to its old level, such a move giving confidence in the value of money and resulting in lasting business recovery, rather than causing "chaos" as predicted by the Government.

Crude Production Under Control

CRUDE oil and natural gasoline production during December, 1934, averaged about 2,532,000 bbl. per day, 6,000 bbl. per day above the preceding month; and 106,000 bbl. per day above the crude oil and natural gasoline production in December of 1933. The December, 1934, average daily crude oil production exceeded the federal allowable by 47,000 bbl. per day, marking a very appreciable improvement over preceding months. For the first time since federal regulation of production was imposed California overproduced 38.9 percent of the national total, Texas overproducing but 16.2 percent of the national total. Oklahoma continued to produce under its allocation, while Kansas overproduced but 34,000 bbl. during the whole month. For the first week in January crude oil production was actually 74,800 bbl. below the federal quota.

The federal daily allowable was increased on December 17 from 2,307,000 bbl. to 2,460,300 bbl. to meet the refinery demand. The crude oil runs to stills during December, 1934, averaged about 2,535,000 bbl. per day, 89,000 bbl. per day above the runs to stills during the preceding month. The increased activity was due to the desire of refiners to establish large inventories of gasoline, which were deemed to have declined below the desirable economic minimum.

Total stocks of all oils were deeply cut into for the second consecutive month, declining during November, 1934, by 10,265,000 bbl. to a total of 569,316,000 bbl., indicating a daily gross decline in stocks of 318,000 bbl.

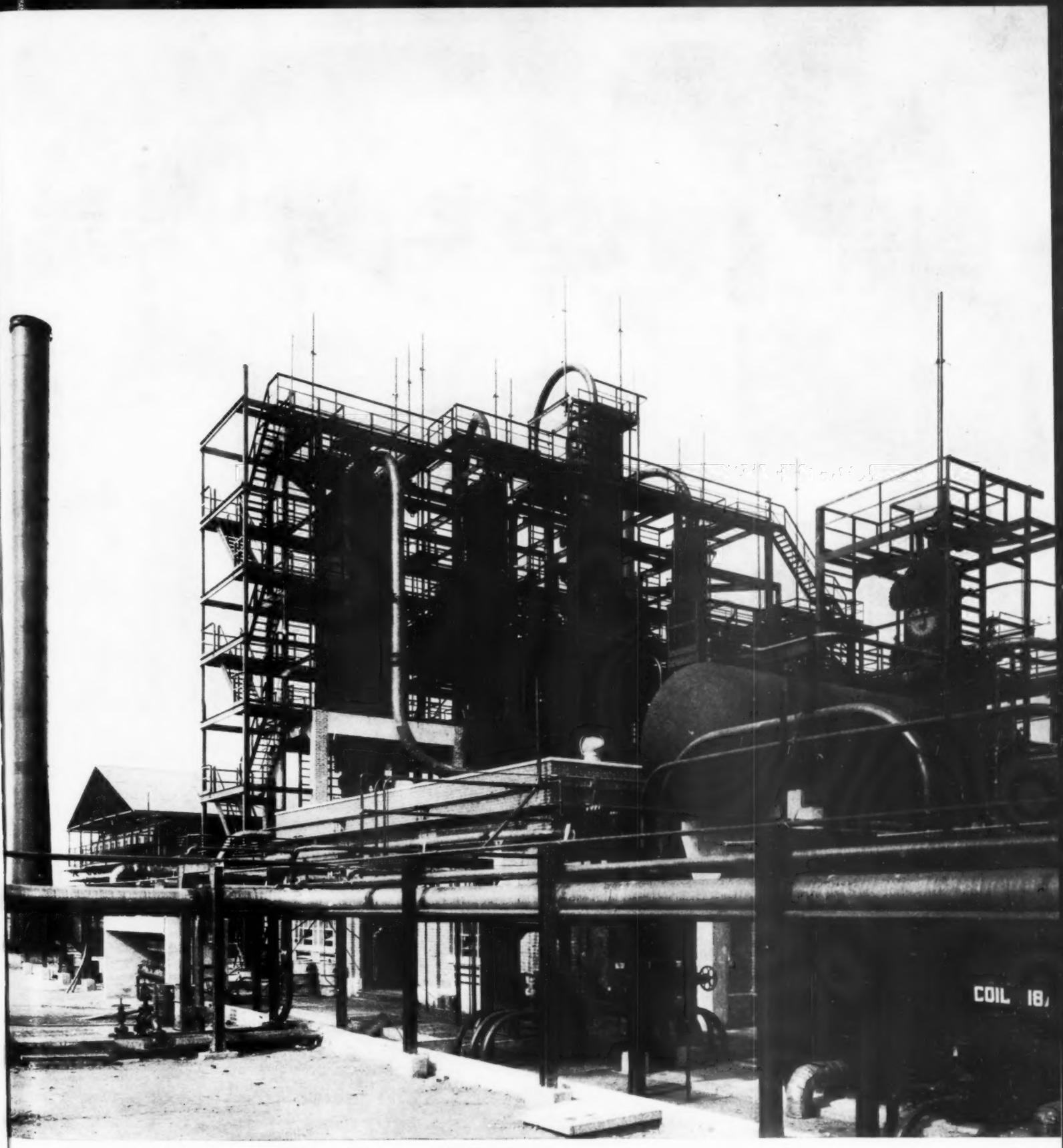
Record Motor Fuel Demand

INDICATED domestic demand for motor fuel during November, 1934, averaged, 1,161,000 bbl. per day, a decrease of 4.13 percent under the daily average during October, 1934, when 1,211,000 bbl. were consumed; it was 151,000 bbl. per day above the domestic motor fuel consumption in November of 1933, an increase of 14.95 percent; 154,000 bbl. per day above the domestic fuel consumption in November of 1932, an increase of 15.30 percent; and 108,000 bbl. per day above the domestic motor fuel consumption in November of 1931, the peak year, a remarkable increase of 10.25 percent. As indicated in the preceding issues of WORLD PETROLEUM the record-breaking domestic motor fuel consumption can be at least in part credited to price wars which bought the service station prices to around 10 cents per gallon, all taxes included, in the most thickly populated areas of the United States: New York—New Jersey, Boston, Chicago and St. Louis.

The NEW YORK TIMES weekly combined business index registered a very sharp gain during December, advancing 8 points to 87.1 in the week ending January 5, 1935. The index stood at 80 on January 1, 1934; at 70 on January 1, 1933, and at 77 on January 1, 1932. Thus the business activity made an excellent showing during the past month, advancing to the highest level since December of 1930, discounting the sharp but short lived advance to 99 in July of 1933. The most promising gain was in the steel mill activity, that index advancing in the week ending January 5 from 64.5 to 72.3, suggesting improvement in basic industries. The gold clause case, now before the U. S. Supreme Court, is at this time an upsetting influence.

The daily rate of imports of motor fuel averaged 74,000 bbl. in November, 1934, 17.44 percent above the preceding month; 23.55 percent below the exports in November of 1933; 6.92 percent under the exports in November of 1932; and 40.70 percent under the motor fuel exports in November of 1931.

(Continued on page 124)



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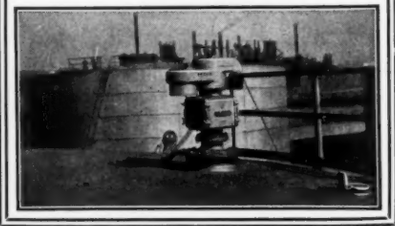

On December 1, 1934, motor fuel stocks at refineries, plants, terminals and in transit amounted to 47,516,000 bbl., an appreciable decline of 1,747,000 bbl. as compared with stocks on hand on November 1, 1934, indicating that during November motor fuel demand exceeded supply by 58,100 bbl. per day.

Tax on Taxes

A REMARKABLE illustration of the overtaxing of motorists occurred in Metropolitan New York, where the new 2 percent city sales tax was ruled to apply on the full retail price. City Collector W. Reid, announced: "The city sales tax is imposed on the total selling price of gasoline, including the federal and state excise taxes." To illustrate, if the selling price of ten gallons of motor fuel is $1.30, and if federal and state taxes add 40 cents to the price, the sales tax is collected on $1.70. In this case the tax on the product is 2.6 cents, and the tax on tax is 0.8 cents.

Fitts—Oklahoma

DURING the last three months about twenty large Simpson formation oil wells were brought in in the Fitts pool (*) all within formerly proven area. These completions bring the total number of Simpson producers in the Fitts pool to thirty-two, of which five are marginal wells which showed salt water in the main producing horizon and were subsequently plugged back to make small wells. These completions to date have an estimated potential in excess of 250,000 barrels per day, of which the Carter Oil Company (S.O.N.J.) with five producing wells has 55,000 barrels, Stanolind Oil & Gas Company with two wells has a potential of about 10,000 bbl; Magnolia Petroleum Company (Socony-Vacuum) with four wells has a potential of about 40,000; and E. H. Moore with five producing wells has a potential also of about 40,000 bbl., the balance being distributed among smaller operators. Some 55 wells are drilling at this writing in the Fitts pool, all within proven area, and by March 1, 1935, the open flow potential production of the field will probably soar to around 600,000 bbl. per day. It is a remarkable achievement in cooperative effort of operators in the Fitts pool, many of them small independents, that production has been kept to a minimum pending the reclassification of the field by the state Corporation Commission, which has been done early in January. The first potential tests on the producing wells in the field are to be taken during January and on the basis of these tests the field will be prorated, it is anticipated, to around 10,000 bbl. per day. A most conservative program is now being worked out by the producers of the Fitts pool which will include well spacing, setting of surface pipe and flow strings of casing; method of taking potentials through

(Continued on page 126)

*See map published in October, 1934, WORLD PETROLEUM, page 399.

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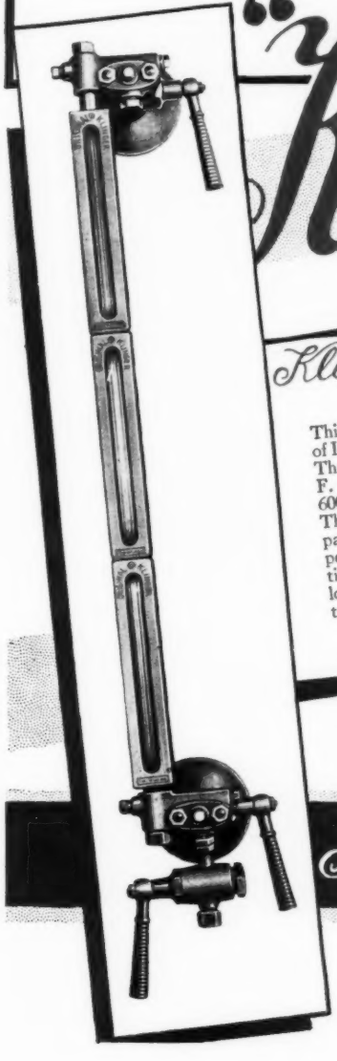

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tubing under uniform conditions throughout the field; and regulations providing for producing each day, rather than crowding the allowable for the month into the first few days of the month, as was done in Oklahoma City field.

The Stanolind Oil & Gas Co. (S.O. Ind.) followed the example of the Carter Oil Company and entered the Fitts pool by purchasing a one-half interest in two proven leases of J. H. Schaffer in Section 30-T2N-R7E, and in Section 25-T2N-R6E, both entirely proven for production and amounting to 140 acres together. The reported consideration of $700-000 very closely approximates the price paid by the Carter for its 540 acres, Stanolind Oil & Gas Co. paying $10,000 per acre and the Carter having previously paid $9,600 per acre. The Phillips Petroleum Company entered the field by purchasing 160 acres on the west side of the field under the Southwest quarter of section 25-T2N-R6E of which, however, only a part will probably prove productive.

The very important folding in the Fitts field was further emphasized when E. H. Moore No. 1 Smith in the northwest corner of Section 31-T2N-R7E after correlating 600 ft. lower than producing wells in the field, a dip condemning the test to be a dry hole, drilled through the fault at around 2,860 ft. cutting out about 600 ft. of section in the Caney group, including Cromwell sand, Pennsylvanian, and has since been completed as an excellent producer in Simpson. The fault though which No. 1 Smith drilled outcrops about 1,300 ft. due northwest from the well and at that surface point the displacement is but 150 ft., but it apparently increases to around 600 ft. at the Atoka formation unconformity. Approximately similar structural features have been encountered in E. H. Moore No. 2 Wirick in Section 29-T2N-R7E and in No. 1 Ackers in the NE NW NE of section 36-T2N-R6E, all three wells defining the field to not over one location, 660 ft., in a southern direction. To date the Fitts pool has been proven for prolific oil production over an area one mile wide, due north and south, and two miles long, due east and west, or 1,280 acres. Further extensions of the Fitts proper appear probable, possibly in an easterly direction, although complicated faulting makes any prediction hazardous.

Three and a half miles due southeast of Fitts, Lynch et al. No. 1 Thompson in Section 1-T2N-R7E, while correlating some 600 ft. lower than the producing wells in Fitts, showed 1,500 ft. of oil in the hole from the Hunton limestone at 3,835 ft. to 4,010 ft., and made a very small producer after acid treatment. This very important test is now deepening to the Simpson and if located on a separate closed structure it may open a second field in the Franks Graben.

The Stanolind Pipe Line Co. (S. O. Ind.) and the Oklahoma Pipe Line Co. (Carter-S.O.N.J.) are each completing a pipe line into the Fitts field tying the field with their trunk systems, while the Sinclair-Prairie Pipe Line Co. (Consolidated) is reported to be surveying a route for its projected pipe line into the field.

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